Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXI November 19, 1930 No. 4

In This Issue

Uses Vibrating Screens Exclusively for Classifying Crushed Stone 20

The Plant's Liability for Controlling the Spread of Dust and Smoke 25

New Canadian Aggregates Plant Employs an Original Dewatering Method 27

Effect of Grading of Gravel and Sand on Voids and Weights—Part I 33

Omaha Firm Sells Both Central-Mixed and Mixed-in-Transit Concrete 40

Aids in Handling One's Self and Others in Relation to Accident Prevention 44

Single Diesel Engine Supplies Power to Operate All Plant Machinery 49

What 56 Cities Think of Central-Mixed Concrete for Street Paving 54

Crushed-Stone Plant Builds Profits by Producing Pre-Mixed Concrete 56

Solves Problem of Hauling Rock Asphalt with 3 1/2-Mile Aerial Tramway 59

Men of the Industry 61
Personal Mention 62
Coming Events 63
Financial News 64
Traffic News and Comment 65
Pumpings from the Old Pit 66
Review of Foreign Practice 67
Recent Patents 68
Legal Information 69
Insurance Problems Discussed 70
New Machinery and Supplies 71
Manufacturers' Publications 75

Next Issue December 3, 1930

Published bi-weekly on Wednesday for producers and manufacturers of Sand, Gravel, Stone, Cement, Lime, Gypsum and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

Copyright, 1930, by
COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.

H. W. BAUMGARTNER, *President*
V. E. LARSEN, *Vice-President*
S. A. PHILLIPS, *Directing Editor*
ARTHUR J. HOSKIN, *Editor*
W. E. TRAUFFER, *Asst. Editor*
HARRY F. UTLEY, *Asst. Editor*

New York Representatives:
E. M. BUCK, 68-43 Clyde St.
Telephone *Boulevard 5259*
Forest Hills, L. I., N. Y.
V. A. LESLIE, 301 W. 108th St.
Telephone *Academy 7990*
New York, N. Y.

Cleveland Representative:
W. E. COATES, 2198 Elbur Road
Telephone *Boulevard 0688W*
Lakewood, Ohio

Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central, and South America; elsewhere $1 additional for each year. Single copies 20 cents.

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXI November 19, 1930 No. 4

In This Issue

Uses Vibrating Screens Exclusively for Classifying Crushed Stone 20

The Plant's Liability for Controlling the Spread of Dust and Smoke 25

New Canadian Aggregates Plant Employs an Original Dewatering Method 27

Effect of Grading of Gravel and Sand on Voids and Weights—Part I 33

Omaha Firm Sells Both Central-Mixed and Mixed-in-Transit Concrete 40

Aids in Handling One's Self and Others in Relation to Accident Prevention 44

Single Diesel Engine Supplies Power to Operate All Plant Machinery 49

What 56 Cities Think of Central-Mixed Concrete for Street Paving 54

Crushed-Stone Plant Builds Profits by Producing Pre-Mixed Concrete 56

Solves Problem of Hauling Rock Asphalt with 3 1/2-Mile Aerial Tramway 59

Men of the Industry 61
Personal Mention 62
Coming Events 63
Financial News 64
Traffic News and Comment 65
Pumpings from the Old Pit 66
Review of Foreign Practice 67
Recent Patents 68
Legal Information 69
Insurance Problems Discussed 70
New Machinery and Supplies 71
Manufacturers' Publications 75

Next Issue December 3, 1930

Published bi-weekly on Wednesday for producers and manufacturers of Sand, Gravel, Stone, Cement, Lime, Gypsum and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

Copyright, 1930, by
COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.

H. W. BAUMGARTNER, *President*
V. E. LARSEN, *Vice-President*
S. A. PHILLIPS, *Directing Editor*
ARTHUR J. HOSKIN, *Editor*
W. E. TRAUFFER, *Asst. Editor*
HARRY F. UTLEY, *Asst. Editor*

New York Representatives:
E. M. BUCK, 68-43 Clyde St.
Telephone *Boulevard 5259*
Forest Hills, L. I., N. Y.
V. A. LESLIE, 301 W. 108th St.
Telephone *Academy 7990*
New York, N. Y.

Cleveland Representative:
W. E. COATES, 2198 Elbur Road
Telephone *Boulevard 0688W*
Lakewood, Ohio

Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central, and South America; elsewhere $1 additional for each year. Single copies 20 cents.

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXI CHICAGO, NOVEMBER 19, 1930 No. 4

Builds Gas Pipe-Line to Serve Cement Co.

USES FUEL FOR FIRING KILNS

That the plant of the Colorado Portland Cement Co. at Portland, Colo., will be served with natural gas by means of a pipeline from Devine, ten miles east of Pueblo, Colo., was the announcement made recently by F. J. Trelease, district manager for the Colorado Interstate Gas Co.

The line will be started within a short time and will be constructed at an estimated cost of $500,000, according to the announcement. It must be completed by March 1.

R. J. Morse, vice-president of the Colorado Portland Cement Co., is quoted as saying that his firm has signed a 15-year contract for gas which will be used to fire the rotary kiln at the plant.

Operation will be resumed at the Portland plant by January 1, it was reported. For the past few weeks, the plant has not been running at capacity, and the resumption of production is expected to start about the first of the year.

It has been estimated that the daily consumption of gas at the Portland plant will be 6,700,000 cu. ft. daily.

While the pipe line construction is in progress the Portland plant will be piped for gas distribution and new equipment will be installed.

Dewater Cement Slurry by Electrical Methods

Tests are being conducted at the Northwest experiment station of the United States Bureau of mines, Seattle, Wash., in coöperation with the University of Washington, on the removal of water from cement slurries by electrical methods.

The electrical process under investigation uses comparatively simple equipment; a tank to hold the slurry, a fixed cathode plate, and a rotating anode drum on which the slurry collects. The partially dewatered material is scraped off the revolving drum in a layer from ¼ in. to ⅜ in. thick containing about 22 per cent water.

Preliminary tests with a Seattle cement slurry indicate that about 54 per cent of the water can be removed with a current consumption of from 0.05 to 0.07 kw.-hr. per pound of water, which is only about one-fifth of the theoretical energy necessary to evaporate the water by the usual heating agent, and a mixture of sodium silicate and sodium carbonate has given the most efficient results.

This electrical process is now in use in Germany in several plants for dewatering clays in the purification of kaolins and fire clays.

California Cement Firm Will Build Storage Silos

The Pacific Portland Cement Co. of San Francisco has awarded a contract for 200 tons of reinforcing steel to the Pacific Coast Steel Corp. of San Francisco. The steel is to be used in the construction of reinforced-concrete storage silos at the Pacific plant at Redwood City, Cal.

To Resume Quarrying of Virginia Black Marble

According to reports emanating from Williamsport, Va., the black marble quarries located in the Mosquito Valley near that city, which were worked extensively during the war, are to be re-opened. Philadelphia capital is said to be behind the project.

Cement Association in Convention at Chicago

The annual meeting of the Portland Cement Assn. was held Monday, Tuesday and Wednesday of this week at the Blackstone Hotel, Chicago. The first day was given over to committee meetings, papers dealing with various phases of plant operation were presented at the mill session on the second day, while the third and final day was devoted to business matters, including the election of officers.

The annual banquet was scheduled for Wednesday evening, Nov. 19, as the closing event of the meeting.

Volunteer Cement Moves Its Offices in Knoxville

The offices of the Volunteer Portland Cement Co. have been removed from the Holston Bank Bldg., to the new Fidelity-Bankers Trust Bldg., located at Gay and Union Streets, Knoxville, Tenn.

Blast in Mine Kills 3 Columbia Cement Men

VICTIMS ON INSPECTION TOUR

Three officials of the Columbia Cement Division, Pittsburgh Plate Glass Co., of Zanesville, O., met their deaths in the explosion of the Sunday Creek Coal Co. mine No. 6 at Athens, O., on Nov. 5. They are Robert D. Parsons, superintendent, Thomas Trainer and V. L. Roberts. The blast snuffed out the lives of 83 persons and injured many more, some of whom are not expected to live.

The three victims were members of an inspection party, guests of the coal company, visiting the mine when the explosion occurred.

Mr. Parsons was well known in the cement industry. He was born at Akron, O., August 21, 1885, of an old New England family of Colonial descent. Mr. Parsons was educated at Akron schools and later at Carnegie Tech of Pittsburgh, where he was graduated as an electrical engineer. His first position was with the Diamond Rubber Co. at Akron, which was afterwards absorbed with the B. F. Goodrich Co., who made him its technical manager of their rubber plant at Paris, France, which position he held until 1924.

During the war he enlisted in the U. S. Navy for a term of four years, where he received the commission of senior lieutenant. He was appointed manager of the Columbia Cement plant of the Pittsburgh Plate Glass Co. at Fultonham, near Zanesville, O., in 1924, which position he held until his untimely death.

He is survived by his widow Dorothy Galt Parsons, two sons, Hugh Galt, 14, and Robert Day, 11; also by his mother and sister Harriet, residing at New Hartford, Conn.; Mrs. Lee Dean, another sister of New Canaan, Conn.; and one brother, William E. Parsons of the firm of Bennett, Parsons & Frost, architects, Chicago, Ill.

Mr. Trainer was 39 years old and had been traffic manager of the firm since 1924. Surviving are his widow, mother, one sister and a brother. Mr. Roberts, age 37, had been plant foreman for the company for ten years. Besides a widow and two children, he leaves his parents and a sister.

Complete 9,349 Miles of Federal-Aid Road

FIGURES FOR 1930 FISCAL YEAR

The 48 states and Hawaii, with the aid of federal funds, completed improvements on 9,349 miles of federal-aid highways during the fiscal year 1930, according to records of the Bureau of Public Roads, U. S. Dept. of Agriculture, which coöperates with the states in highway development. At the end of the year, 9,915 miles were in process of improvement, and 3,469 miles were approved for construction. The amount of federal funds disbursed during the year on all active road and bridge projects amounted to $75,880,963—about $6,200,000 less than for 1929.

In the federal-aid system, at the close of the year, there were 193,049 miles of highways, 84,012 miles of which had been improved with federal aid. The federal-aid operations have resulted in the improvement of less than one-half of the system, and the states and other agencies with local funds have been simultaneously improving roads in the system so that today nearly all of it is improved to some degree.

The mileage improved during the year with federal aid was divided into three classes: 7,317 miles, upon which no federal funds had previously been spent, were classified as initially improved; 2,011 miles, previously improved to some extent with federal aid, were improved further by additional joint work of the states and federal government; and 21 miles, built in previous years and since subjected to traffic in excess of the anticipated volume, were reconstructed and improved with more durable surfaces. These 21 miles are the first to be reconstructed under the federal-aid plan.

Included in the initially-improved and stage-construction classification were 46 miles of bridges and approaches. At the close of the year, 85 additional miles were under construction or approved for construction.

The total of 9,328 miles of initially-improved and stage-construction projects completed in 1930 is 57 miles less than for 1929, and is lower than in any year since 1924. The decrease was due to the contraction of the program to a $75,000,000 basis (the sum appropriated by Congress for several years) and the final absorption of the unobligated balance of funds appropriated for the earlier years.

With the authorization of federal funds for each of the years 1931, 1932 and 1933 increased to $125,000,000, the bureau anticipates an increase in mileages improved. When the $75,000,000 originally authorized for 1931 was increased by the apportionment of an additional $50,000,000 in April, the states immediately responded by increasing the allotments to definite projects to $102,498,084 for the fiscal year, as compared with $70,428,896 during the fiscal year 1929.

Of the 84,012 miles in the federal-aid system classified as improved with federal funds at the end of 1930, 12,448 miles are graded and drained earth roads; 7,166 miles are untreated sand-clay roads; 17 miles are bituminous treated sand-clay; 28,608 miles have untreated gravel surfaces and 482 bituminous-treated gravel surfaced with bituminous-treated macadam; 603 miles are surfaced with bituminous-treated macadam; 742 miles are improved with low-cost bituminous-mixed surfaces; 4,057 miles are surfaced with bituminous macadam; 3,205 miles are paved with bituminous concrete; 23,693 miles are Portland-cement concrete pavements; and 905 miles are block pavements. The remaining 332 miles consist of bridges, each more than 20 feet in span, and their approaches.

Stanley Owens, Safety Engineer, Joins P. C. A.

On December 1 Stanley Owens will join the staff of the Portland Cement Assn. as safety engineer.

Mr. Owens is at present safety engineer at the Bureau of Safety, an organization which handles the safety-insurance work of the Insull and Midwest Utilities group. For several years he has been engaged in the general work of the Bureau of Safety and has held membership in a number of important committees relating to national and intercompany safety affairs. He is a graduate of Armour Institute of Technology, Chicago.

While the safety work of the Portland Cement Assn. will remain under the general direction of A. J. R. Curtis, assistant to general manager, it is expected that Mr. Owens will handle a large share of the field work.

Penn-Dixie Heads Visit Cement Plants in Iowa

W. H. Klein, general manager of the southern division of the Pennsylvania-Dixie Cement Corp. and Edson Hardy, designing engineer at the Richard City, Tenn., plant of Penn-Dixie were recent visitors in the vicinity of Valley Junction, Ia., where they inspected the Penn-Dixie and Hawkeye plants.

Pennsylvania Sand Firm Fights Rates on Stone

Charges of unjust and unreasonable carload rates on crushed stone were made recently by the Tioga Washed Sand & Gravel Co., of Tioga, Pa., in a complaint filed with the Pennsylvania Public Service Commission against the New York Central and Erie railroads.

Universal-Atlas Will Build Plant at Toledo

TERMINAL WILL COST $1,000,000

The Universal-Atlas Cement Co., steel corporation subsidiary and largest Portland-cement producer in the United States, is said to have announced plans to construct a new storage terminal and sacking plant on the Maumee River at Toledo, O. The plant will represent an investment of at least $1,000,000, it is reported.

Cement will be shipped to Toledo by boat upon completion of the new terminal to be distributed by rail and truck. The Universal-Atlas company has also a similar plant under construction at Milwaukee.

The Huron Portland Cement Co. of Detroit built a storage-packing plant at Toledo early this year, cement being received by ship from its Alpena, Mich., plant.

Pipe-line facilities to the new Universal-Atlas Toledo location have already been established by the Sun Oil Co., according to the *Toledo Times*.

Discuss Road Research at Meeting in December

A highway research board meeting, under the auspices of the National Research Council, will be held December 11 and 12 at Washington, D. C. Results of research work in connection with the building and use of highways will be heard and discussed. Papers to be presented include the following:

"Some Experience in Design of Concrete Mixtures," Bert Myers, Iowa Highway Commission.

"Durability of Concrete"—C. H. Scholer, Kansas State College.

"A Study of the Strength of Concrete as Made in Cuba"—Miguel Villa, Havana University.

"Cost Economies in Concrete Bridges"—C. B. McCullough, Oregon State Highway Commission.

"The Relation of Certain Frost Phenomena to the Subgrade,"—V. R. Burton and A. C. Benkelman.

Pennsylvania Quarry to Begin Operations Soon

The Charles Price limestone quarry and plant located at East New Castle, Pa., leased recently from E. J. O'Brien, is soon to be operated, with crushed stone for road use and agstone as the principal products. Machinery valued at $15,000 has been assembled at the plant.

Adopts an Efficient Ground-Storage Plan

UNUSUAL DESIGN AT OHIO PLANT

Up-to-date producers of sand and gravel are rapidly adopting ground storage as a relief valve for excess material that can not be shipped as fast as it is produced. Ground storage permits a plant to be operated at a more uniform rate from day to day with resulting economies in operating cost and the elimination of many worries connected with plant labor. The trouble with many ground storages is that they are not well conceived from an engineering and operating standpoint and consequently fail to achieve a high degree of efficiency in operation.

The American Aggregates Corp. of Greenville, O., has recently installed at its Fort Jefferson, O., plant, a ground storage that is an outstanding example of good design. The arrangement is simple and involves no unusual equipment. Its effectiveness results mainly from the careful study that was given it in order that the various units should be in the proper relation to each other to insure the most efficient operation.

The gravel comes from the screening and washing plant to the storage ground on a belt conveyor supported on a trestle, the discharge end of the conveyor being 35 ft. above ground. The initial conical pile deposited by the conveyor can therefore be about 35 ft. high and can eventually form one end of a semi-circular stock-pile having a maximum height of 40 feet. This initial pile affords excellent digging conditions for the clamshell bucket by means of which the gravel is delivered to a truck-loading bin, to gondola cars on a siding, or to the main stockpile.

The principal mechanical feature of the installation is an electrically operated Model 60 Wiley Whirley with a 50-ft. boom, capable of handling a 1½-cu. yd. clamshell bucket, or a total load of 12,000 lb. at a radius of 50 ft. from the center of the machine's rotation. The Whirley is mounted on a concrete pier 15 ft. high, located so that the arc described by the bucket on a 50-ft. radius from the center of rotation (which is equivalent to about a 30-deg. boom angle) crosses the center of the initial pile and the bin hoppers, is tangent to the center-line of the siding, and coincides with the ridge of the stockpile. Due to this intelligent layout, the major part of all handling operations can be accomplished without the necessity of booming up and down, thus conserving time and increasing the handling capacity per unit of time.

The swing between the initial pile and the siding loading point is about 90 deg. and that between the initial pile and the bin hoppers about 30 deg., so that high capacity may be realized by minimizing these distances. The stockpile occupies about 180 deg. of the circle, will be 40 ft. high and will contain, when full, approximately 15,000 cu. yd. or 20,000 tons. The stockpile on its outer side will rest against a bank cut into a hill on a 45-deg. slope, so that, as the material is reclaimed, it will slide to the foot of the slope where all of it can be reached by the bucket on its normal 50-ft. radius.

This is a most compact and efficient storage, because it is contained in a ground area of about 125 ft. by 150 ft., and about 80 per cent of it can be reclaimed on the 50-ft. radius.

The hoisting speed of the Wiley Whirley is 200 ft. per min. and the swinging speed is 2½ r. p. m. On a 90-deg. swing under steady operation, the machine can make about 100 cycles per hr. which, with an average 1½-cu. yd. load, is equivalent to 150 cu. yd. per hour. Allowing for the usual operating delays, its normal handling capacity on a 90-deg. swing is around 120 cu. yd. per hr.

Laying of Trackage to Boulder Dam Under Way

With the laying of the 30-mile branch railroad from the main line of the Union Pacific Lines at Las Vegas, Nev., to the site of the development now well under way, the construction of the Boulder dam project, to be known as Hoover dam, is considered as begun. The Merritt, Chapman & Scott Corp., New York, has the contract for the railroad and is employing a Lima 101 1¼-cu. yd. Timken-equipped shovel, made by the Ohio Power Shovel Co., Lima, O., for the major part of the excavation.

Waterloo, Ia., Producer Buys Humboldt Concern

Concrete Materials Corp. of Waterloo, Ia., has purchased the entire business and assets of the Humboldt Gravel & Tile Co., Humboldt, Ia., and will operate the Humboldt plant after Dec. 1, 1930. The plant will be enlarged for increased production.

International Acetylene Assn. Meets in Chicago

The thirty-first annual convention of the International Acetylene Assn. was held Nov. 12, 13 and 14 at the Congress Hotel, Chicago. Several important papers on welding were presented by nationally prominent engineers identified with the industry.

Oregon Gravel Concern Is Enlarging Facilities

The Ross Island Sand & Gravel Co. of Portland, Ore., is preparing to erect a truck-loading tunnel and a new belt-conveyor system at its plant at Portland to facilitate production.

Sand Plant Is Razed by Incendiary Blaze

DAMAGE IS PLACED AT $100,000

Fire, believed of incendiary origin, early on the morning of Oct. 29 nearly wiped out the glass sand plant of the Eastern Silica & Chemical Co., located twelve miles west of Winchester, Va. The loss was estimated by John F. Penrose, president, at $100,000, and was partly covered by insurance.

The plant will be rebuilt as soon as insurance adjustments are made, according to Mr. Penrose. The fire was within two miles of the village of Gore, half of which had been leveled by flames early in August, with a loss of $500,000.

Efforts to call Winchester firemen by Dewey Shoemaker, night watchman, were fruitless and it was discovered later that the telephone wires between the plant and the Gore exchange had been cut with snippers a quarter of a mile from the works, which discovery led to the arson theory.

Nine frame buildings were consumed by the flames, also eleven electric motors, an air compressor and all the machinery, most of which, of a modern type, had been installed only recently. The power house and generators alone escaped damage.

Buildings destroyed included two washrooms, two crusher rooms, wet bin, drier room, boiler and engine rooms, operating and drying room, and an immense drying bin. Two box cars loaded with glass sand also burned.

U. S. Gypsum Announces 50-Cent Extra Dividend

Indicating their confidence in the outlook for the building industry throughout the country, directors of the U. S. Gypsum Co. on Nov. 12 declared an extra dividend of 50 cents a share on the common stock, payable on or before Dec. 31, 1930, to stock of record Dec. 15. The directors also declared the regular quarterly dividends of 40 cents a share on the common and $1.75 a share on the preferred. A complete report of the company appears on the financial page of this issue.

Propose New Municipal Quarries at Montreal

The city of Montreal is presenting to the provincial Government of Quebec for consideration a bill which would authorize the city to spend $7,000,000 for public improvements. One of the clauses of this bill would authorize the expropriation of all quarries operating within the city limits of Montreal. As there are at present nine such quarries, the passing of this bill would mean the erection of a number of new plants in the vicinity of Montreal.

Building in October Greatest Since May

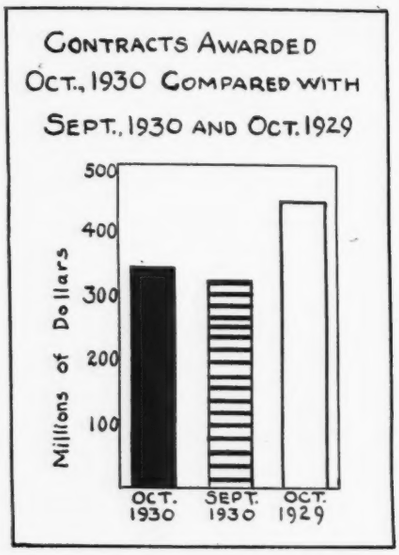
CONTRACTS TOTAL $337,301,400

October contracts awarded for new residential building in the 37 states east of the Rocky Mountains were larger than in any month since May, but showed a decline of about 25 per cent from the valuation reported in October, 1929, according to F. W. Dodge Corp. Out of a total new construction volume amounting to $337,301,400 new residential building undertaken during the past month accounted for $104,670,300 or 31 per cent of construction awards of all types in the 37 eastern states. Total construction undertaken in this territory during October aggregated $337,301,400 as compared with $331,863,500 for September and $445,642,300 for October, 1929. Total new construction contracted for in the 37 eastern states during the ten elapsed months of 1930 was valued at $4,022,024,900 as against $5,046,909,900 for the corresponding ten months of 1929.

The October contract record showed $121,435,200 for non-residential building; $111,195,900 for public works and utilities; and $104,670,300 for residential building. Of the non-residential total, $35,652,600 was for new commercial buildings; $28,554,400 for educational structures; $16,149,900 for industrial plants; $14,553,100 for public buildings; $11,555,800 for hospitals and institutions; $9,583,100 for social and recreational buildings; and $5,386,300 for religious and memorial buildings.

October awards in New England totaled $29,890,000 as against $35,309,800 in September and $40,040,700 in October of last year. For the Metropolitan area of New York new construction undertaken in October was valued at $80,053,300 as against $81,572,900 for September and $80,408,200 for October, 1929. Upstate New York reported October contracts of $13,479,300 as against $16,039,400 for the previous month and $21,194,900 for October a year ago. Contracts awarded in the Middle Atlantic States amounted to $32,438,900 as against $31,184,000 in September and $51,531,500 in October, 1929. The Pittsburgh territory (Western Pennsylvania, West Virginia, Ohio and Kentucky) showed October contracts at $48,508,500 as compared with $38,238,000 for September and $77,619,300 for October of last year. October contracts in Southern Michigan totaled $11,287,100 as contrasted with $17,691,100 for September and $28,125,800 for October a year ago.

October contracts in the Chicago district (Northern Illinois, Indiana, Iowa and Southeastern Wisconsin) amounted to $33,409,600 as against $44,194,300 in September and $59,941,300 in October, 1929. In the Central Northwest (Minnesota, the Dakotas, Northern Michigan, and Northwestern Wisconsin) construction undertaken in October totaled $5,370,000 contrasted with $11,871,700 in September and $4,671,900 in October, 1929. October construction awards in the St. Louis territory (Southern Illinois, Eastern Missouri, Northeast Arkansas, Western Tennessee, and Northwest Mississippi) totaled $29,980,800 as against $14,168,200 in September and $14,269,600 in October of last year. October contracts in the Kansas City district (Western Missouri,



Kansas, Oklahoma and Nebraska) amounted to $22,147,100 as against $9,883,900 in September and $18,731,000 in October, 1929. Texas showed October awards of $9,392,600 against $12,941,300 in September and $19,471,000 in October, 1929. October contracts in the New Orleans territory (Louisiana, Southwestern Arkansas, and Southeastern Mississippi) totaled $6,611,700 as against $4,221,800 in September and $10,386,700 in October of last year. The Southeastern territory (the Carolinas, Georgia, Florida, Alabama and Eastern Tennessee) showed October contracts valued at $14,732,500 as against $14,547,100 in September and $19,250,400 in October, 1929.

Florida Rock Operator Resumes Production

The White Rock Co. of Williston, Fla., has resumed operations at its plant and quarry near that place. Production at an 18-car-per-day schedule is being maintained.

Plan to Erect $150,000 Kaolin Plant in Georgia

The property of the E. J. Nelson Kaolin Co., Dry Branch, Ga., has been acquired by new interests, headed by Robert S. Finney, and the new company has been organized to operate nearby kaolin lands. Plans are said to be under way for a mechanical washing plant and mill, to cost about $150,000 with equipment.

National Gypsum Co. Basks in Prosperity

BUSINESS EXCEEDS LAST YEAR'S

Record sales are reported for the first ten months of the year by the National Gypsum Co., Buffalo, N. Y. Despite a slowing up in building and general business, 560 new dealers have been added to the company's distribution system. Net sales increased 10 per cent as compared with a record corresponding period in 1929.

Earnings climbed sharply. Although net for the last four months has not yet been estimated, it is known that earnings for the first six months totaled $108,312, against a deficit of $78,851 in the parallel period last year.

M. H. Baker, president of the National Gypsum Co., reports that income since June has been steadily rising and it is assured that 1930 will be the best year in the company's history.

The settling of a severe price war which had been waged for the last three years in the gypsum industry has been reflected by a more stabilized net, according to Mr. Baker.

"Our business turned the curve in September. We have gained so far in October and expect to maintain the high level in November and December. A seasonal downturn is expected in the early part of next year. Around March we believe that sales will start to climb to new peaks," he declared.

The National Gypsum Co. was founded five years ago by a group of Buffalo capitalists. The company is engaged in the mining and manufacturing of gypsum, lime products, wall plasters and wall board. The first mill was located in Clarence Center, N. Y., where a 75-year supply of gypsum is said to be available.

Other plants are in Jackson, Mich., and Luckey, Ohio. At the latter site, it is estimated that there is a deposit of some 7,000,000 tons available.

Two years ago the Luckey Lime & Supply Co. was bought at a price exceeding $600,000. This plant is considered one of the world's most modern lime-producing units.

Management of the company is in the hands of M. H. Baker, president, Buffalo; C. E. Williams, vice-president; Elmer E. Finck, treasurer, Buffalo; F. E. Davis, secretary; T. W. Hammond, assistant treasurer. Directors are: J. W. Anderson, M. H. Baker, H. H. Burkhardt, Buffalo; E. E. Finck, Buffalo; W. G. Houck, Buffalo; W. N. Currie, C. E. Thompson, V. M. Nelson, C. E. Williams, E. W. G. Borer and E. F. Guth.

Hercules Cement Orders Ten Steel Railway Cars

The Hercules Cement Corp., Philadelphia, has ordered ten steel railway cars for transporting cement, the order being placed with the Standard Steel Car Co., of Pittsburgh.

Road Builders Study Equipment Problems

MET AT PITTSBURGH ON NOV. 15

Highway equipment authorities representing the federal, state, city and county governments met Nov. 15 in Pittsburgh, Pa., to consider equipment problems, at the call of M. De Glopper, materials and equipment engineer, Michigan state highway department, and chairman of the equipment committee of the American Road Builders' Assn.

A general specification to meet the average conditions of plant, transportation and placing in street and road work was discussed by the committee on central- and transit-mixed concrete. Its work dealt with the handling of concrete from the time it leaves the central-mixing plant until it is laid on the subgrade. The result of a recent questionnaire on this subject will be found elsewhere in this issue of PIT AND QUARRY.

There is a general desire among manufacturers and highway officials for this information, according to the committee chairman, R. Keith Compton, director of public works of Richmond, Va.

The committee on grading methods and grading equipment, of which H. J. Spelman, chief engineer, West Virginia state highway department, is chairman, confined its work to a study of the construction and compaction of embankments. A staff engineer, who made a tour to study soils, hydraulic fills, use of tractors and rollers for compaction, and other equipment and methods, made a report. All sources of information were utilized to solve what is viewed as one of the important problems of road building.

R. L. Cochran, Nebraska state highway engineer, is chairman of a group which is collecting data on maintenance equipment and methods on four road types: earth surface, gravel surface, surface treated, and pavement; on maintenance of bridges, snow removal, and general maintenance.

According to General Chairman De Glopper, these equipment committees represent the greatest coöperative movement between manufacturer and consumer now under way in the highway industry. Far-reaching studies are being undertaken, and far-reaching benefits to both groups will naturally follow.

Warner Company Sets Up Enviable Safety Record

The sand-and-gravel division of the Warner Company of Philadelphia and Wilmington, Del., is in the limelight, according to the *Warner American News* because there were only two lost-time accidents in the whole division during the month of September. Both of these occurred in the river transportation department and resulted in a loss of seventeen working days. The river transportation department has one day charged against it, but this was on account of an accident occurring in the previous month.

The three dredges operated by the company again came through 100 per cent. This was the eighteenth consecutive month that these dredges have worked without a single lost-time accident. To have worked nearly 180,000 hours without a single day lost by anyone because of a personal injury is a record to be proud of. The Wilmington retail yards, which have worked over 132,000 hours this year had only ten days of lost time due to personal injuries. Last year this same department worked nine months, from April to December inclusive, with only one lost-time accident.

Demand in Florida for Fresh-Water Aggregate

The Atlas Rock Co., producers of fresh-water rock and sand from the company's quarries near Miami, Fla., report an increasing demand for their product in the metropolitan Miami area. Last month brought a larger movement and more frequent orders from retailers of Atlas Rock Co. rock and sand, officials said.

Prospects are for a continued increase in the demand for the rock and sand during the fall months, J. Martin Deer, president of the company, said, and for still larger requirements during the winter and spring months. In sight for next year are the large government projects: first, the new post office building, and, later in the year, the bulkheading work along Miami river, Mr. Deer pointed out.

Monolith Cement Plant Is Temporarily Closed

A temporary seasonal shutdown of the plant of the Monolith Portland Midwest Co., located south of Laramie, Wyo., effective November 1, with plans for reopening in February, has been announced by F. J. Anderson, superintendent. Shipping of cement will continue through the winter with 10 men remaining employed. The shutdown will occasion temporary unemployment of 35 men. The company's quarry has also been closed.

New Sulphur Co. Plans Huge California Plant

Plans have been announced by the newly-organized Sunland Sulphur Co. for the construction of one of the largest sulphur-manufacturing plants in the country on a seven-acre site acquired near Fresno, Cal. The Sunland company, incorporated at $150,000, will invest approximately $100,000 in the plant, according to T. L. Harper, president.

Wisconsin Lime Men Begin Research Plan

MORTAR STRENGTH IS STUDIED

In order that the exact strength of lime mortar might be determined, the Wisconsin Lime Manufacturers' association recently set aside a fund for research at the University of Wisconsin to study the strength of the lime. Ivan Cole, Milwaukee, was granted a research fellowship to carry on the work.

The preliminary tests, just completed, indicate that the Wisconsin product is capable of resisting more than ordinary stresses. The results were recently disclosed at a meeting of representatives of the lime manufacturing association.

The present research schedule calls for the testing of 3,000 specimens of Wisconsin lime mortars during the next six months. In this way the specific values of the Wisconsin product will be determined.

The lime tested comes from approximately twenty plants scattered throughout the state.

Producer to Build Two Asphalt-Mixing Plants

Announcement has been made by W. F. Culbert & Sons, producers of limestone products, of plans to erect at Marion, Va., and near Lynchburg, Va., two of the largest asphalt premixing plants in the South. Construction of the Marion plant will start within a month, it is said.

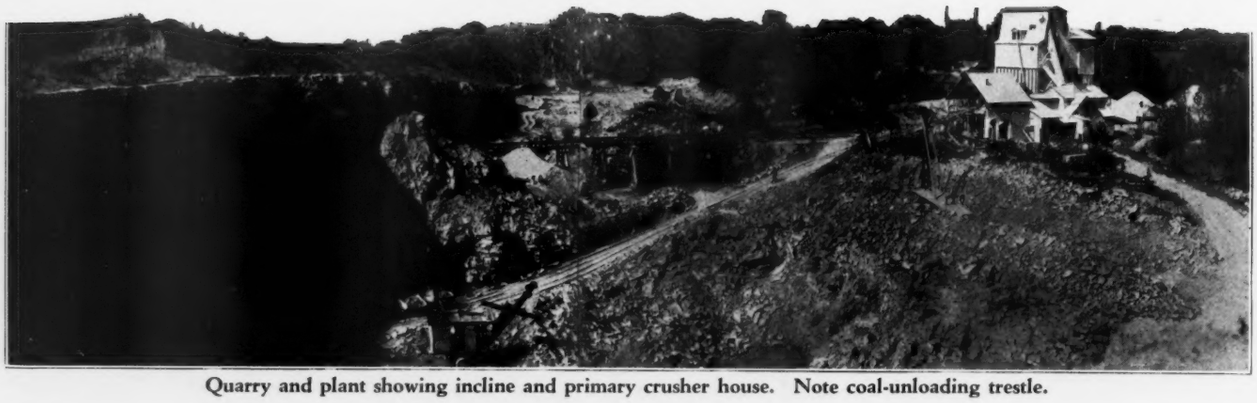
The plant will be in four all-steel units and will eventually consume the entire output of the large Culbert quarry at Marion, with the exception of commercial grades of limestone. The four units will include a drying and screening plant, the second unit will be a boiler plant, the third unit a weighing plant and the fourth unit will be a 60-ft. mixing tower.

The Lynchburg plant, to be erected after completion of the Marion plant, will have the same number of units. The product of both plants will be used in road paving.

Erection of the Marion plant will, with the beginning of full operation, mean the doubling of the present quarry force with the installation of additional quarry equipment. Full operation is expected to begin in the early spring.

California Co. Acquires Russian River Deposits

The Basalt Rock Co. of Napa, Cal., has acquired sand and gravel deposits on the Russian River, near Healdsburg, Cal., adjacent to the Russian River Sand and Gravel Co. property. The Basalt company, of which Edward Hellyer is president, will continue to operate its present plant at Napa. No announcement concerning the development of the new Russian River property has been forthcoming.



Quarry and plant showing incline and primary crusher house. Note coal-unloading trestle.

Uses Vibrating Screens Exclusively for Classifying Crushed Stone

Ohio Producer Rebuilds Plant Tipple and Adopts New Method of Quarrying

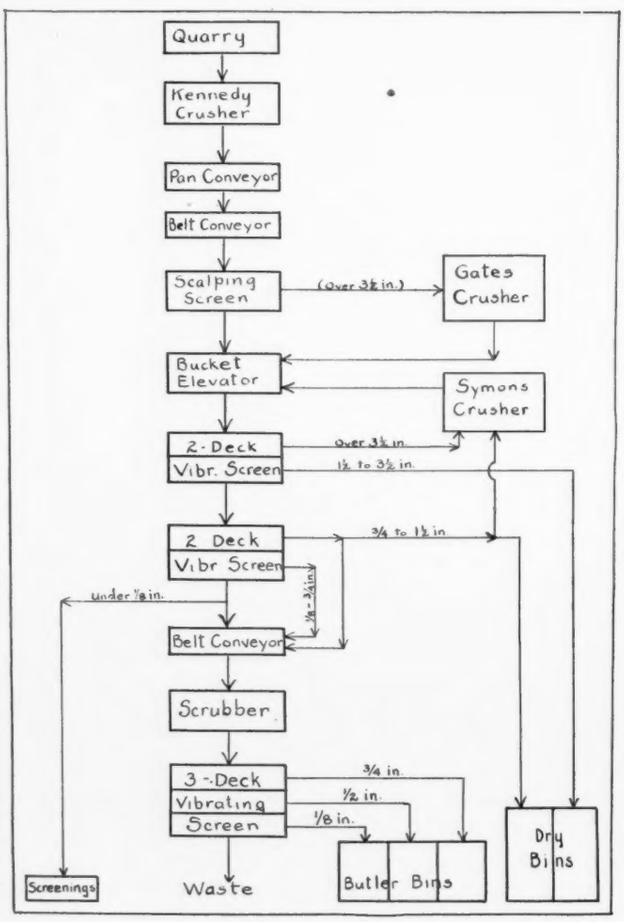
By M. F. BEISBIER

ANOTHER Ohio crushed-stone producer has turned to the vibrating-screen method of classifying materials. A complete installation of four vibrating screens is among the major improvements made in the plant equipment. These units are employed in every screening process, from the scalping to the final washing of materials.

After the purchase, in 1928, of the present property—which was formerly operated for many years as a crushed-stone and lime plant—the Cincinnati Quarries Co., the present operator, planned the complete and immediate overhauling of all equipment. The tipple building was found in need of considerable repair, so it was decided to rebuild it entirely. Several other improvements were made, including the addition of a Symons cone crusher and the rebuilding of the primary crusher platform.

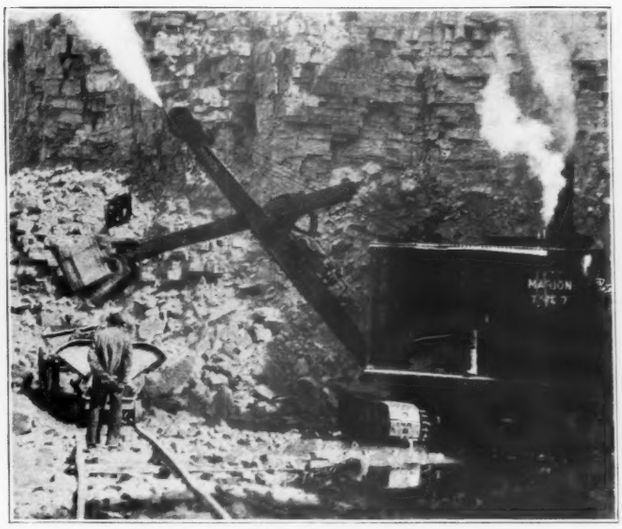
Two Butler Bin Co. steel storage bins are among the features of the new tipple. These bins are used only for storing the wet materials from the washing and scrubbing equipment. They are of the self-cleaning type, and are supported by heavy steel columns. The two bins are built side-by-side, and are adjacent to the bins constructed of steel and timber and that are used for the storage of the dry materials. The screening equipment is above the bins and completely housed by a frame structure. Two sizes of materials are stored in the Butler bins, one bin carrying the 1½-in. to ¾-in. grade, and the other carrying the ¾-in. to ⅛-in. grade. Their capacity is rated at 65 tons each.

The dry-materials storage bins are of timber construction with a skeleton of steel framework. Each bin is heavily braced with T-irons anchored in the floor to prevent bulging in the event of either one being full when the other is empty. Heavy concrete columns support the bins, permitting two railroad sidings to have access to them beneath, for either carloading or truck loading. A description of the screening equipment is given later in tracing the flow of materials through the plant.



Flow-sheet of Cincinnati Quarries Co. plant.

Stripping and clean-up shovel.



Loading blasted rock into quarry cars.

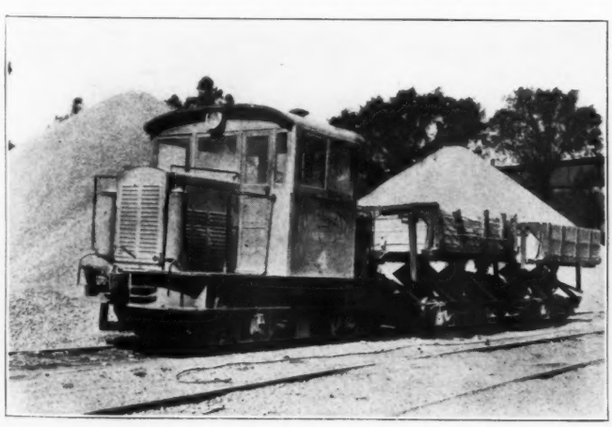
The Cincinnati company has made several changes in the method of blasting the ledges in the quarry. The face was formerly maintained at a height of 50 ft. An entirely new cut was made into the old floor, increasing the height of the face to 80 ft., which will provide a higher percentage of breakage in avalanching and access to a better grade of stone. A Clipper well-drilling rig, made by the Loomis Machine Co. of Tiffin, O., is employed to drill the blast holes. The holes are drilled with a 4½-in. bit, are spaced 12 ft. apart, and are 15 ft. back of the face. About 150 lb. of Atlas 60-per cent Semigelatin explosive is loaded into the bottom of each hole, the balance of the hole being loaded with 40-per cent explosive. Since the 80-ft. face has been established, approximately four tons of rock have been obtained per pound of explosive used, which is considered exceedingly satisfactory. The 30-ft. face was blasted at a rate of 2.15 tons of rock per pound of explosive.

Owing to the dry summer, it has not been necessary to pump seepage water from the new quarry floor. A Weinman 6-in. centrifugal pump, driven by a 40-hp. motor, is maintained for this use and will be installed near a new sump to discharge into Paint Creek which is nearby.

An 18-ft. bank of overburden is removed by an Erie B steam shovel, loading into K. & J. (Kilbourne & Jacobs Mfg. & Eng. Co., Columbus, O.) 6-cu. yd. side-dump cars. These cars travel on a standard-gauge track extending along the top of the ledge over to the edge of an abandoned portion of the quarry where the earth is dumped. The cars are drawn by a Cincinnati Car Co. 12-ton gasoline locomotive.

Blasted rock is loaded with a Marion No. 7, 1-cu. yd. shovel into Koppel 2½-cu. yd. cars traveling on a track system near the face of the quarry and extending to the plant incline. The Koppel cars are handled in pairs by a small Brookville gasoline locomotive to the incline, where they are elevated separately to the primary crusher platform. An Allis-Chalmers double-drum hoist, driven from a plant line-shaft, draws each car up to the platform with one drum, while the other drum is used to dump the rock, on either side of the track, into the spider of the primary breaker.

Three crushers are employed in the reduction of the blasted rock to the finished crushed-stone sizes. They are located in a separate structure adjacent to the new tipple. A Kennedy No. 8 crusher, driven by a 50-hp. Allis-Chalmers motor, is set at 4-in., discharging directly to a Jeffrey 30-in. pan conveyor, 15 ft. long, which transfers the crushed material to



Gasoline locomotive used for intraplant transportation.

View showing steel storage bins for washed materials.

Primary crusher and pan-conveyor equipment.

a belt conveyor. The conveyor, in turn, transports the material to a Simplicity 3-ft. by 6-ft. scalping screen equipped with a 3½-in. wire screening deck. Goodyear 30-in. rubber belting and Jeffrey pulleys and idlers are used in the conveyor, which is 40 ft. long. It discharges to the Simplicity scalper through a baffle box which checks the velocity of the spill-over, and spreads the crushed rock evenly upon the screen. Oversize rock from the scalper is sent to a Gates No. 5 crusher set at 2 in.

Throughs from the scalper and the crushed stone from the Gates crusher are chuted to a Jeffrey bucket elevator which delivers the material to the two Simplicity classifying screens in the tipple.

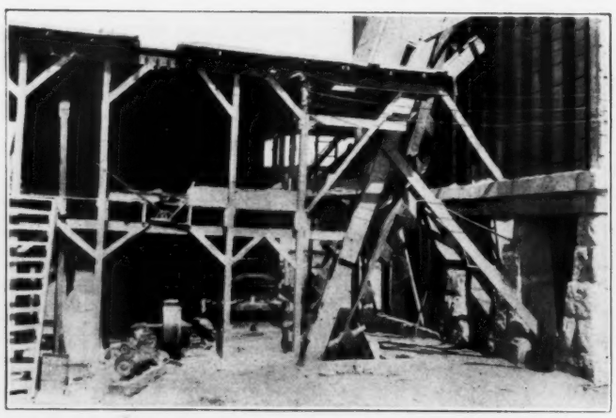
Blast-hole drill rig on old quarry floor.

Buckets on the elevator are 30 in. by 12 in. by 12 in. deep. The elevator is driven by a 15-hp. Allis-Chalmers motor through a Foote Bros. speed reducer, and a Foote Bros. flexible coupling connected to the head-shaft.

Two Simplicity 4-ft. by 8-ft. vibrating screens are mounted in the top of the tipple, placed one above the other, at right angles to prevent coördination of vibration. The top deck of the first screen has a 3½-in. mesh, the bottom deck a 1½-in. mesh. Oversize from the top deck is returned to a Symons 3-ft. cone crusher adjacent to the Gates unit. It is set at ¾-in. and returns its crushed material to the classifying screens on the same elevator. The 1½-in. to 3½-in. material is sent to a bin. The throughs from the bottom deck are flumed to the top deck of the second classifying screen. This last unit has a

Primary crusher house; note new concrete piers.

¾-in. top deck and a ⅛-in. bottom deck. The rejects from the ¾-in. screen (which are from ¾-in. to 1½-in. in size) are returned to the Symons crusher or to a dry storage bin. Material from ¾-in. to ⅛-in. in size passes to a 14-in. belt conveyor which carries it to the Columbia scrubber. The throughs from the ⅛-in. or bottom deck are chuted to a dry bin as screenings. The scrubber



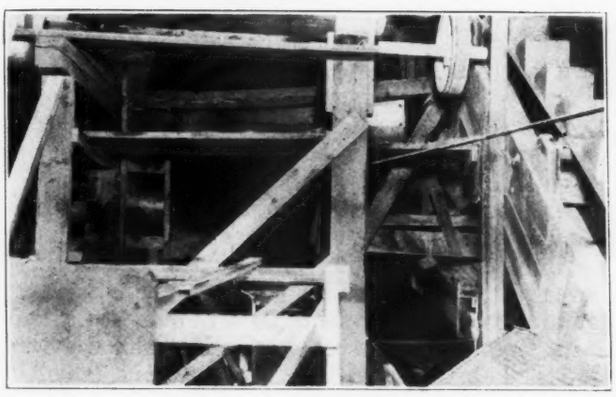
Auxiliary secondary crusher and bucket elevator.

conveyor is 33 ft. long and equipped with Columbus Conveyor Co. idlers and pulleys and has a Goodyear belt.

All materials from 1½-in. to ⅛-in. can be thoroughly washed and scrubbed at the Cincinnati plant. They not only receive a washing on a vibrating

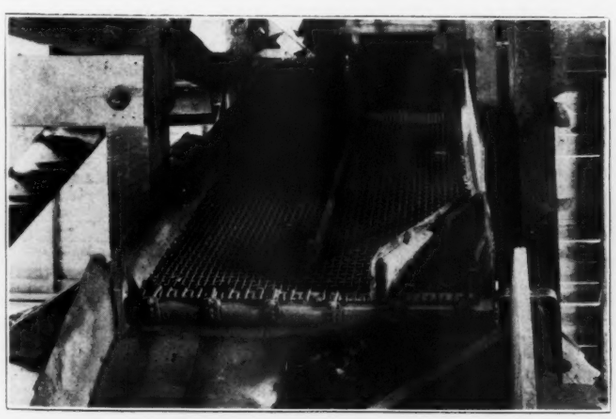
screen, as is the case with the average plant, but they are sent through an 8-ft. Columbia conical scrubber. This unit has an 8-ft. drum in the center of the cone which receives the broken stone and, by means of a number of chains, thoroughly scrubs and agitates it with streams of fresh water. The crushed stone leaves the drum, flows down the cone which dewaters it, and finally falls to the top deck of the Simplicity 3-deck vibrating screen, where it receives a final washing from jets of water. It is then classified into respective sizes and stored in the Butler bins beneath. The three meshes on the Simplicity washing screen are ¾-in., ½-in., and ⅛-in. respectively.

Two line-shafts serve to power practically all the equipment contained in the crusher house. The first shaft is powered by a 100-hp. Allis-Chalmers



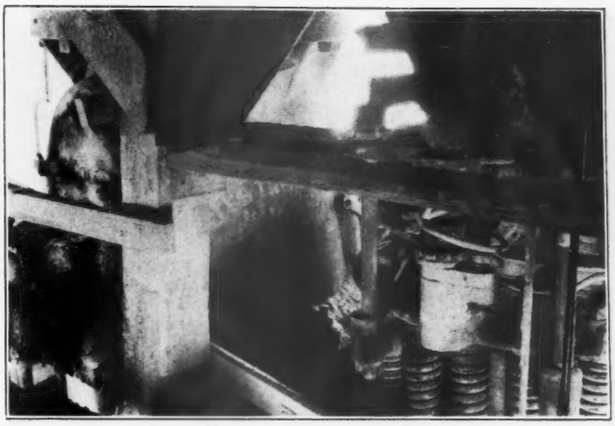
Scrubber unit above and final washing and classifying screen at lower right.

synchronous motor which serves the Symons crusher, the Gates crusher, the 40-ft. belt conveyor, and the scalping screen. The second line-shaft is powered by a 50-hp. motor and serves the Kennedy crusher, the hoist, and a Gardner Rex air compressor. Vacuum Oil Co. bottle oilers have been installed throughout the plant on every line-shaft



Second vibrating screen classifying unit, mounted at 90 deg. to first unit.

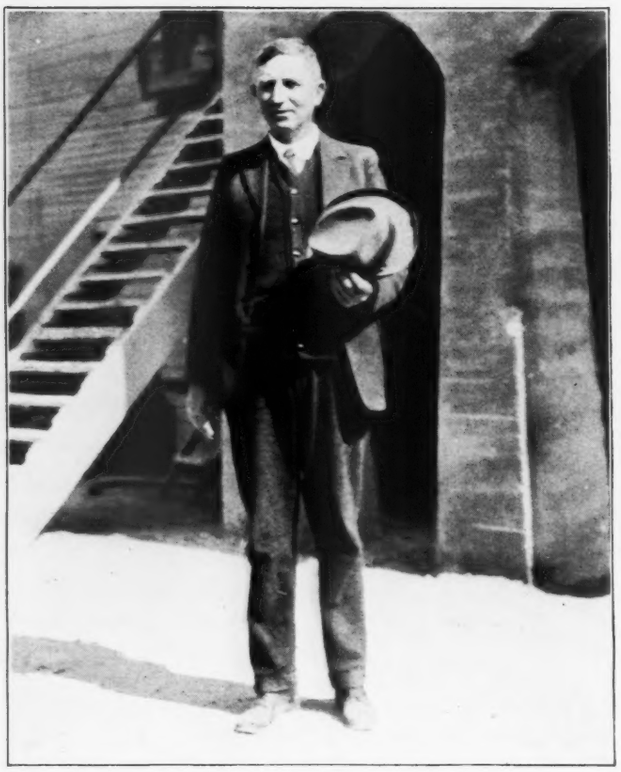
or pulley-shaft bearing cap. The bottles are positive in their action, and the attendant can tell at a glance whether they are full or empty. As the shaft rotates, a small amount of oil is withdrawn from the bottle, insuring positive lubrication.



Gyratory crusher at left, cone crusher at right.

Washing water for the scrubber and the screens is obtained from Paint Creek adjacent to the property. A Weinman Pump Mfg. Co., Columbus, O., 6-in. centrifugal pump, driven by a 40-hp. Fairbanks-Morse motor, draws water from the creek through a Goodrich 8-in. reinforced suction hose and discharges it, through an underground pipeline, to the riser located at the tipple. Adjacent to the fresh-water riser at the tipple is the waste-water downspout. To insure rapid disposal of the waste water, a line is taken by a T from the fresh-water riser with reduction in size, as it enters the waste-line in an elbow, just below ground-level. The branch is 4-in. in size at the point of take-off at the

Pump-house showing winch to raise or lower suction hose.



W. A. McAllister, general superintendent.

fresh-water line and is reduced to 1-in. as it enters the waste-line elbow, thereby forming a nozzle which flushes the waste water and material with considerable velocity. The waste-line is carried underground, eliminating the nuisance of drippage and unsightliness of an overhead flume.

An additional crushing plant is maintained as an auxiliary to be used only in the event of a breakdown of the Gates or Symons crusher. This plant has not seen service this year and was used but two days in 1929, which speaks well of the regular crushing equipment. The auxiliary consists of a Telsmith gyratory crusher which receives the ¾-in. to 1½-in. material from the classifying screens, and returns the crushed stone to the ¾-in. deck of the lower classifying screen by means of a Goodyear 18-in. by 65-ft. belt elevator. The Telsmith crusher is powered by a 50-hp. motor.

Crane for handling stock-pile materials.

Extensive stock-piles of materials are maintained in the yards of the company. Such materials are handled by a Northwest 105 crane equipped with an Owens ¾-cu. yd. bucket. Cars are moved on the company's siding by a Cincinnati Car Co. 12-ton gasoline locomotive.

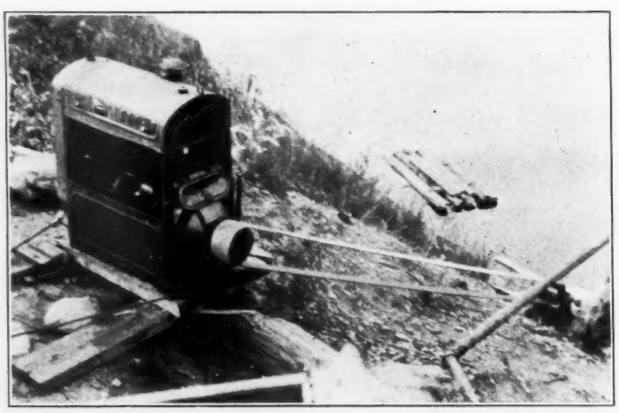
Loosens Tightly-Packed Gravel With an Occasional Shot of Dynamite

After five years of successful operation, Johnson & Son Co., of Tippecanoe City, O., has made several improvements to its plant. This company began in a small way, digging and loading by hand, and has steadily increased its business until the equipment necessary for an improved product and quantity production was warranted.

The pit is exceptionally rich in gravel and Clinton sand so tightly packed that the material does not avalanche. A Sauerman ½-cu. yd. slack-line cableway, operating in the pit 40-ft. below water level, is employed for the recovery of the raw material. Occasionally, a package of ten or twelve sticks of dynamite is dropped into the bottom of the pit to loosen the banks of gravel.

A new Deister Machine Co. Plat-O, 3-deck vibrating screen, 2½-ft. by 4-ft. in size handles the entire washing and classifying duty of the plant. It is powered by a Stover 3-hp. gasoline engine. Water for the screens is furnished by a Goulds 4-in. single suction pump, belt driven from a Hercules OX 4-in. by 5-in. 35-hp. engine. The latter unit is completely enclosed. It has been only recently installed. A Universal crusher is employed to reduce the oversize gravel to 2-in.

The mechanical power supply of the plant is furnished by gas engines and two Fordson tractors,



Gasoline engine driving pump which supplies water for washing screens at the Johnson plant.

since the plant is situated a considerable distance from power lines.

The old Cincinnati-Toledo canal passes the company's plant. While the canal is dry and has not been in use for a number of years, it is interesting to note that there is a movement on foot to rebuild it into a super-highway connecting the two cities. An improvement of this kind will greatly benefit the Johnson plant, as well as enhance property values.

The Plant's Liability for Controlling the Spread of Dust and Smoke

Court Rulings on the Nuisance Problem and Allowances for Damage to Property

By LEO T. PARKER

IN some instances, courts will order a plant to pay money damages where the testimony clearly indicates that a complaining property owner can be adequately compensated by such payment. However, whenever the nature of an injury resulting from a nuisance caused by smoke, fumes, gas, or dust, is such that it is continuous, irreparable and the cause of real damage, and is incapable of adequate compensation, a court may afford the aggrieved party relief by granting an injunction against further operation of the plant or, under certain circumstances, the court may order the plant owner to eliminate the source of the nuisance.

Another important point of the law is that although an owner of adjoining property can be compensated by payment of money damages, the court may grant an injunction against continuation of the nuisance.

Operators of non-metallic mineral plants are often harassed by suits for damages from nearby property owners who contend that their holdings have been harmed by dust, smoke, gases or vapors emanating from the plant. This article, which is a digest of recent important court decisions on the subject, was prepared by an attorney who has made a special study of this subject.

For instance, in the leading case of Melvin v. A. L. Stone Co., 94 Pac. 390, it was disclosed that a property owner filed suit against a stone company and proved that the latter operated engines, near to his dwelling, using oil fuel emitting large quantities of greasy soot, dirt and smoke. The property owner testified that the soot and smoke had damaged the house and furniture in the sum of $500.

After carefully considering the evidence, the lower court decided that the property had been injured and damaged, and that large quantities of greasy soot, dirt, and smoke were frequently emitted from the engines operated by the stone company, and rendered a verdict in favor of the property owner for $307 damages, and granted an injunction against the stone company compelling it to operate its plant in the future so as to not further injure the adjoining property. The higher court sustained this verdict, saying:

"Neither do we think that the injunction should have been refused, upon the ground that plaintiff (property owner) could have been compensated by damages . . . . By irreparable injury is not meant such injury as is beyond the possibility of repair, or beyond possible compensation in damages, nor necessarily great injury or great damage, but that species of injury, whether great or small, that ought not to be submitted to on the one hand, or inflicted on the other, and because it is so large on the one hand, or so small on the other, is of such constant and frequent occurrence that no fair or reasonable redress can be had therefor in a court of law . . . . Where the nuisance operates to destroy health, or diminish the comfort of a dwelling, an action at law furnishes no adequate remedy, and the party injured is entitled to protection by injunction."

Nuisance Not Continuous

Various courts have held that, where an injury caused by smoke may be fully compensated for by money damages and such nuisance is not continuous, the damaged property owner is entitled to money damages but is not entitled to an injunction.

It is a general rule that every owner of a non-metallic plant may exercise exclusive dominion over his own property and subject it to such uses as will best subserve his private interests, if the use does not damage or injure others or the adjoining property.

On the other hand, it is important to know that this general rule does not mean that one must never use his own property so as to do any injury to his neighbor or his property. Such a rule could not be enforced in civilized society. Persons living in organized communities must suffer some damage, annoyance and inconvenience from each other. If one lives in the city he must expect to suffer the dirt, smoke, noisome odors, noise and confusion incident to city life. While every person is bound to make a reasonable use of his property so as to occasion no unnecessary damage or annoyance to his neighbor, yet a reasonable use cannot be defined by any certain general rules but must depend upon the circumstances of each case. A use of property in one locality and under some circumstances may be lawful and reasonable which, under other circum-

stances, would be unlawful, unreasonable and a nuisance. It is well settled, however, that the courts will not grant injunctions against the operation of expensive and public benefiting plants simply because the owner of adjoining property complains that operation of the plant occasionally effects inconveniences, discomfort or inconsequential damages.

For example, in Bentley v. Empire Portland Cement Co., 96 N. Y. S. 831, it was shown that a cement plant had been built in a sparsely settled community, at an expense of $650,000, and was using the most approved apparatus. Whenever the wind was in a certain direction, smoke and ashes were carried to a dwelling, about 1,000 feet away, covering everything within and without the house with a heavy dust, in consequence of which the rental value of the property was decreased. The property owner filed suit against the cement company and asked the court to grant an injunction against further operation of the plant. In refusing to grant the injunction the court stated the following important law:

"The manufacturer is not bound to consult the taste, pleasures or preferences of others; but he is bound to respect his neighbors' rights . . . . True something must be conceded to the manufacturer. His business is legitimate. The public has an interest in his productions . . . . In view of these authorities, and many others which need not be quoted, there can be little doubt but that the works of the defendant (cement company) operated, as they now are, constitute a nuisance. They infringe upon the rights of plaintiff. There is a physical interference with her property. They cast upon it considerable quantities of dust and cinders. They materially interfere with her enjoyment of it and with her physical comfort. They lower its rental value. All these are things which the defendant has no right to do. It does not necessarily follow, however, that the court should grant an injunction at the prayer of the plaintiff. In this case, as has been said, the defendant does a large business. It has invested some $650,000 in its plant, and it employs some 70 or 80 men. Apparently it is using the most improved apparatus, is not guilty of any negligence, and an injunction, such as is asked for, would compel it to close its works . . . . Where the damage to one complaining of a nuisance is small or trifling, and the damage to the one causing the nuisance will be large, in case he be restrained, the courts will sometimes deny an injunction."

When Condition May Be Remedied

On the other hand, it is interesting to observe that various courts have held that an injunction will be granted to prevent damage to adjacent property or discomfort to neighbors, irrespective of the extent of the nuisance if the instrumentalities which cause the injury may be remedied.

For illustration, in the leading case of Moon v. National Plaster Co., 66 N. Y. S. 33, a property owner sued a plaster company for damages caused by dust and odors emitted from its plant. During the trial it was proved that the nuisance was not continuous, but only occasionally resulting from defective equipment. The court granted an injunction against the nuisance, saying:

"The case, therefore, seems to be one of a defective machine or machinery improperly used to the damage of another, and a resulting nuisance, which is not avoided even by the use of due diligence upon the part of the owner to obviate the trouble . . . . Plaintiff's (property owner's) damages, sustained before the nuisance was so abated, however, have not been paid; and there is no reason why this court should not award them to him in this

Unnecessary Nuisance

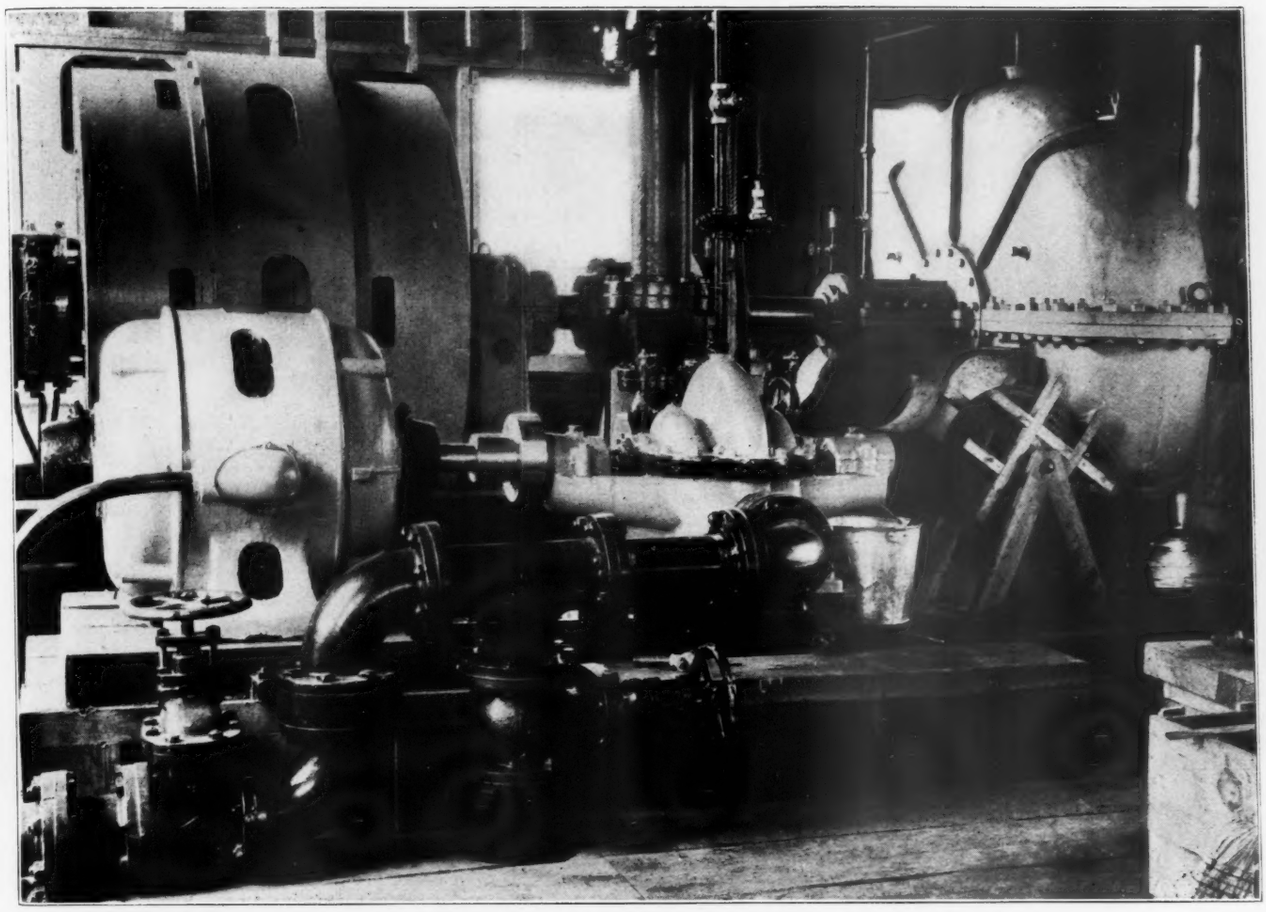
Theoretically, every person has the natural right to have the air diffused over his premises in its natural state, free from all artificial impurities. However, if this rule were literally applied, its application would seriously disturb business, commerce, and society itself. Hence, by air in its natural state and free from artificial impurities is meant pure air consistent with the locality and nature of the community. The use of fuel in manufacturing establishments is necessary. In proportion as the population thickens, the impurities thrown into the air are increased. The pollution of the air, actually necessary to the reasonable enjoyment of life and indispensable to the progress of society, is not actionable; but the right must not be exercised in an unreasonable manner so as to inflict injury upon another unnecessarily.

Obviously, every one has the right to use his property as he sees fit, provided that in so doing he does not invade the rights of others unreasonably, judged by the ordinary standards of life and according to the notions of reasonable men. A person's right to use his property as he pleases implies a like right in every other person, and is qualified by the doctrine that the use in the first instance must be a reasonable one. For this reason the mere fact that smoke, dirt, dust and the like, are emitted from an industrial plant does not give the right to adjacent property owners to obtain an injunction stopping the operation of the plant or changing the manner of its operation.

On the other hand, even in the ordinary uses of plants, the owners are bound, not only to see to it that their smoke stacks are so arranged as to carry off the smoke developed therein, but are also bound to use such fuel as will produce the least obnoxious smoke. This rule is especially applicable if an industrial plant owner unnecessarily increases the amount of smoke emitted from a smoke stack, or in any other manner changes the operation of the plant to the detriment or inconvenience of the owners of nearby property.

For instance, in the leading case of Holman v. Athens Co., 100 S. E. 207, it was disclosed that a nine-story brick building, known as the Holman Building, was located on a corner and on the opposite corner was situated a two-story brick building owned by an industrial plant. This building had

(Continued on page 55)



The 500-hp. motor driving the 15-in. dredge pump. Priming pump and motor in foreground.

New Canadian Aggregates Plant Employs an Original Dewatering Method

Ward System of Sand-and-Gravel Recovery Feature of Hydraulic-Dredging Operations

By W. E. TRAUFFER

MANY new sand and gravel plants go into operation each year but most of these, because of their standardized design or medium size, create no great amount of interest among sand-and-gravel producers. Occasionally, a plant of unusual design or of large capacity is built and merits the attention of the entire industry, because each such plant adds to the progress of the industry.

In a year which has produced comparatively few plants of importance, a new plant combining the features of unusual design and large capacity has been erected by Canadian Aggregates, Limited, at Burford, Ont., Canada, about 30 miles southwest of Hamilton.

Actual construction was started late in February and the plant was in full operation August 16. It has an ultimate capacity of 500 tons per hr., which has not been found necessary this year because of the lateness of the season.

Perhaps the most interesting feature of this new operation is the hydraulic dredge which uses the Ward system. It is common knowledge that this system was invented by F. L. Ward, president of the Ward Sand & Gravel Co., and that it has been used for many years with great success in his plant at Oxford, Mich. A description of this operation was published in the August 15, 1928, issue of PIT AND QUARRY. This system of dredging is still viewed rather skeptically by many operators in the industry, but it has been proved conclusively that, given the right kind of deposit, it will operate with unusual efficiency and economy. The dredge at the Burford plant was designed by S. Andrews of H. G. Acres & Co., Ltd., Niagara Falls, Ont., and was built by the company's own forces.

Close-up of dredge with clam-shell crane operating on bank.

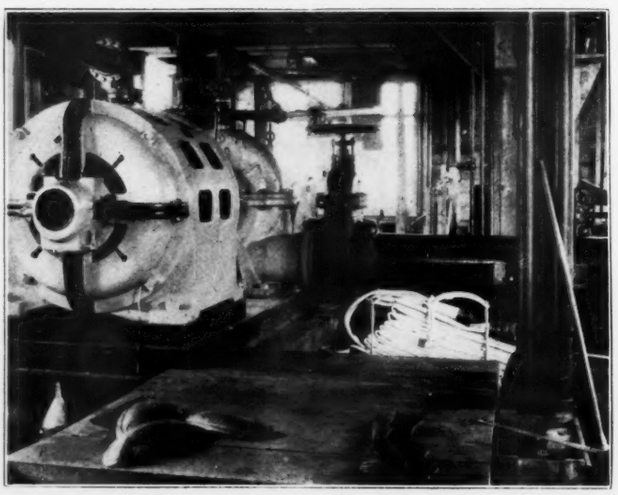
The only feature of the plant itself that might be called original is the dewatering box which removes most of the water and silt from the valuable material before it goes to the crusher and screens. The remainder of the plant follows the best recognized practices that have been thoroughly tested by actual operation in other modern plants. With the exception of the scalping screen, all screens are of the vibrating type.

All footings, foundations, tunnels and pits are of concrete and all building and conveyor framework is of structural steel. Corrugated-metal siding and roofing are used on all buildings. Steel-sash windows with wired glass are standard. Some of the motors are covered with temporary shelters and some of the buildings are not yet fully enclosed. These enclosures will be completed after the period of heavy production is over.

The Disher Steel Construction Co. supplied and erected all of the structural steel. The concrete was poured and all machinery placed by the company's forces.

Jet pump (left) and 5-drum hoist (right) on dredge.

E. L. Cousins was consulting engineer for the company and made the general design of the plant. N. R. Nicoll was chief engineer and in full charge of the laying out and construction of the plant. He is now general manager of the company and supervises the operation of the plant. Previous to his connection with this company Mr. Nicoll was construction engineer for the Toronto Harbour Commissioners.



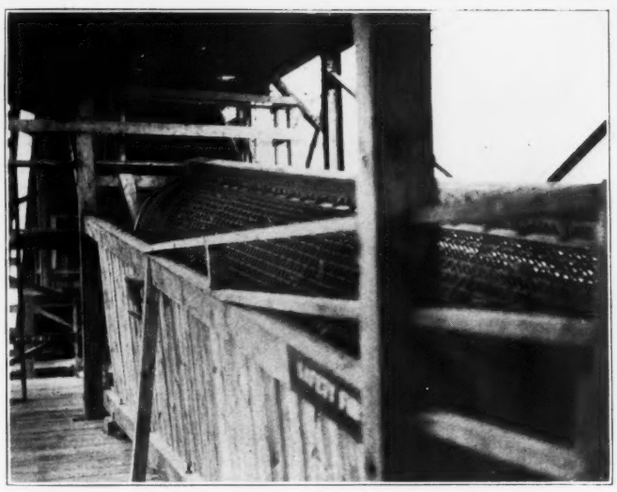
The 300-hp. motor driving jet pump.

The gravel deposit owned by the company covers about 500 acres. The material averages about 40 ft. in depth and has about 49 per cent sand and 51 per cent gravel, very little of which is over 4 in. in size. The overburden is from one to two feet deep and is removed by a Link-Belt Type K25 gasoline crawler crane handling a Blaw-Knox ¾-cu. yd. clamshell bucket. This crane is convertible into a ¾-cu. yd. shovel, the parts for which are on hand. It is powered by a Waukesha 4-cyl., 80-hp. gasoline engine. The overburden is hauled away in trucks to a nearby dump. When not stripping overburden, the crane

will be used for rehandling the stock-piled material.

Dredging was started in an artificial lake dug into the deposit. At the time of the visit to the plant, this lake had been enlarged to a diameter of several hundred feet. About seven feet of gravel is above the water level and is broken down by a jet on the dredge. This is now operating at a depth of about 22 ft., but can go down to 45 ft. when desired.

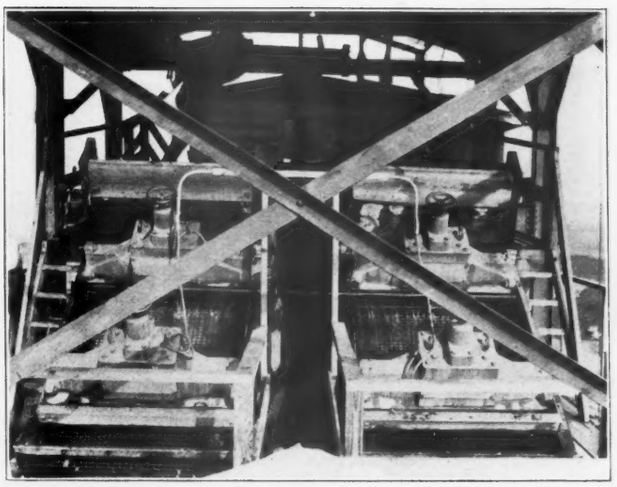
The dredge is of all-timber construction with a hull 30 ft. wide by 60 ft. long containing four watertight compartments. A well 12 ft. wide by 15 ft. deep at the front end gives space for the intake.



Revolving scalping screen with grizzly in background.

Two 40-ft. tapered, steel-pointed spuds 18-in. square at the stern of the dredge hold it in place. Two swinging lines hold the bow end.

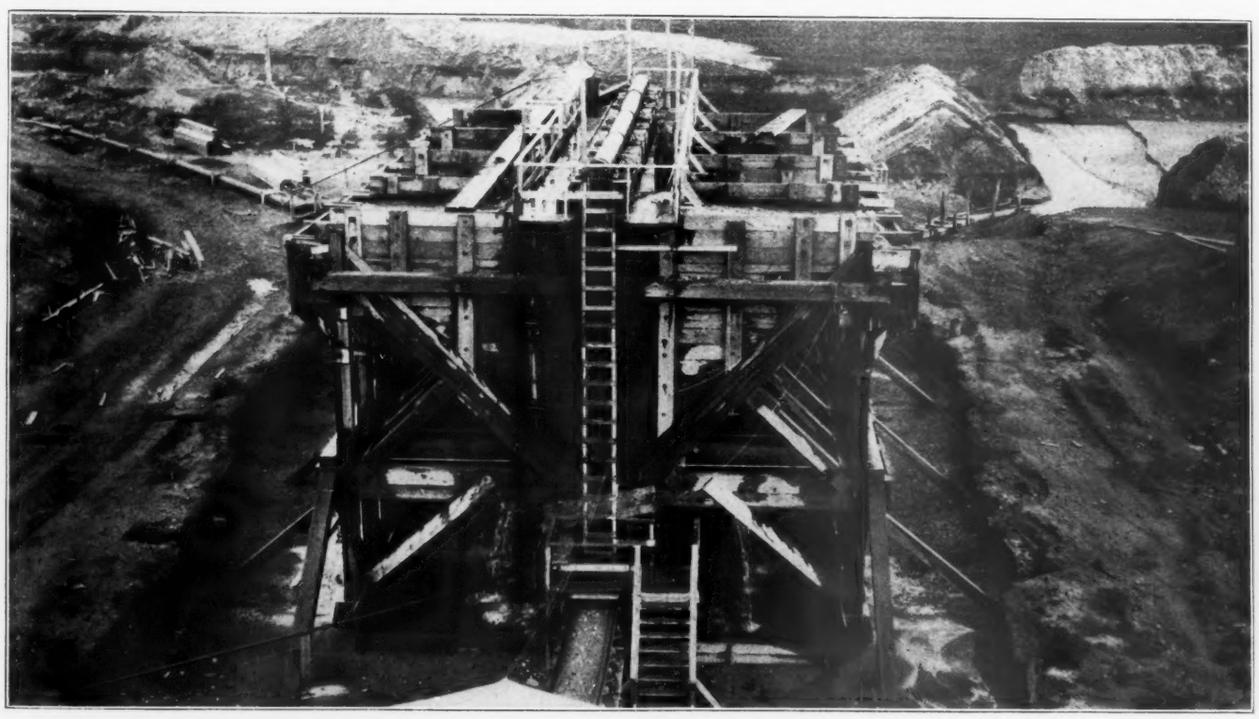
The Ward unit intake has a structural-steel framework and is supported from a timber A-frame.



Single-deck vibrating screens for preliminary sizing.

The A-frame is permanently fastened at a slope of about 45 deg. by cables from the corners of the dredge superstructure which was designed to support this weight.

The main dredge pump at the rear of the dredge is a Morris Style HC 15-in. centrifugal, of the end-intake, bottom-discharge type. It has renewable manganese-steel liners and the shell is in two pieces, being cut horizontally at its axis. This construction allows new liners to be installed when the present ones wear out by merely lifting the top shell of the pump and the impeller. The pump is driven through a Falk spring-type flexible coupling by a Westinghouse 750-hp., 2,200-volt Type H. W. induction motor with a top speed of 490 r.p m. under full load. The pump drive-shaft has a Transmission Ball Bearing Co. thrust bearing, and the main pump bearing is of the water-lubricated rubber type, the



The 4-compartment, 500-ton-capacity dewatering hopper. Pipe-line from dredge at left; conveyor to scalping screen in foreground.

Front view of dredge with suction nozzle raised.

water being furnished at 75-lb. pressure by the jet pump.

The motor and the pump have individual beds both of which rest on a bed consisting of a single 9-ton steel casting. This, in turn, rests on a timber framework supported on the bulkheads and gunwale bottom of the dredge hull so that any slight vibration is absorbed. The motor is of an unusual type, having a welded plate-steel housing instead of the usual cast-iron. The nozzle has a 17-in. intake, which changes to 16-in. at a point just above the suction valve on the intake. The pump has a 15-in. discharge.

Near the dredge pump at the rear of the dredge is the DeLaval 5-in. centrifugal service pump which serves also as a priming pump. This is driven by a Westinghouse 50-hp. motor and has a capacity of 700 gal. per min. (U. S.) against a head of 160 ft. at 1,450 r.p.m. It is primed from a tank above the dredge and, in turn, primes the jet pump.

The jet pump is a Moore Steam Turbine Co. centrifugal, with a 14-in. suction and a 12-in. discharge. This has a capacity of 6,200 gal. per min. at 160-ft. head and 1,500 r.p.m., and is driven through a Moore flexible coupling by a Crocker-Wheeler 300-hp. motor. This is really the main pump in the Ward system of dredging, as it furnishes the suction which feeds the gravel to the booster pump. Its other functions are to prime the dredge pump and to operate the hydraulicking jet which caves down the bank. This jet is fed through a 2-in. line and has a ¾-in. nozzle. The jet pump line is tapped into the intake line of the service pump so that, in an emergency, either could function for the other.

The two spuds at the rear of the dredge, the two swinging lines at the front and the raising and lowering of the nozzle are handled by an Ellicott five-drum hoist at the front of the dredge. This is driven through double-gear reduction by a Westinghouse 30-hp. motor, each drum having an individual friction clutch. The clutches are connected, by chains, with levers in the control room above the

Pipe-line over dewatering box showing how the flow to compartments is controlled.

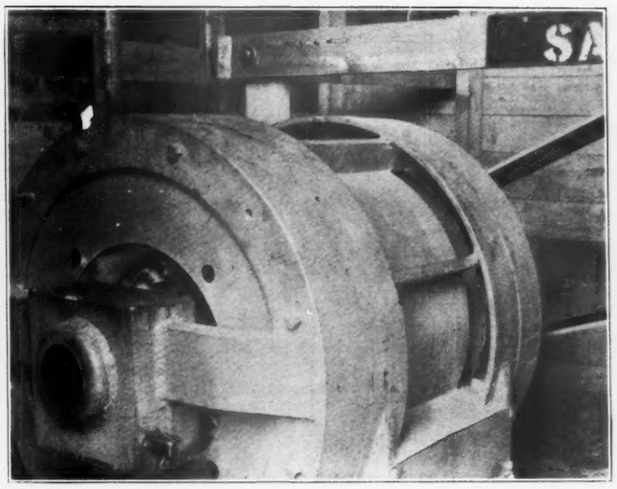
bow of the dredge. The controls for the hoist motor and the usual gauges also are located in this room within easy reach of the operator. The electrical-control room adjoins this room to the rear, making it easy to alter the pump-motor speed.

Power is received on the dredge at 2,200 volts through three power cables on the pontoon line. This voltage is used for the dredge booster- and jet-pump motors. The 750-hp. booster pump motor has six oil switches on the grid circuit for the changes of speeds. The current is reduced to 550 volts for the other motors by three transformers on the first floor of the dredge. Still another trans-

Conveyor in tunnel feeding from bins to the loading building.

Conveyor with spray chute discharging to shuttle conveyor.

Shuttle conveyor in loading building.



Motor and belt drive to crusher.

former gives 110-volt current for lighting. The grids and the switchboard which controls all motors are in the electrical-control room. Each unit also has its individual push-button switch. All electrical equipment is Westinghouse with the exception of the Crocker-Wheeler 300-hp. motor and the starting switches on the jet pump. Crouse-Hinds conduit is used throughout. All the extra-heavy pipe and fittings inside the dredge were furnished by the Ellicott Machine Corp.

The dredge pipe line to the dewatering hopper at the plant is, at present, about 700 ft. long and the head is about 40 ft. The pipe sections are 30 ft.

Scalping-screen building; dewatering box at right.

long and each is supported on two pontoons of three welded barrels each. The pipe on shore consists of 20-ft. sections welded together. A Morris check-valve protects the dredge pump against back pressure. Goodyear, Gutta Percha and Dunlap dredge sleeves are used and Jenkins globe and gate valves are standard on the dredge and line.

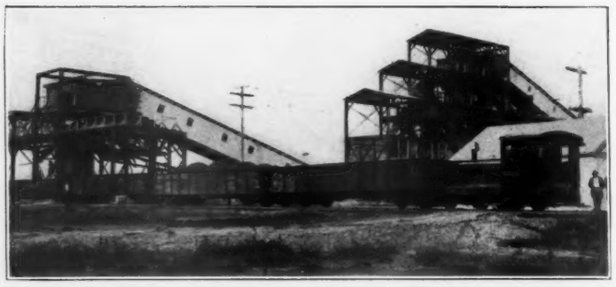
The dredge pipe line runs horizontally over the top of the four-compartment dewatering box where the end of the pipe line is welded shut. Two sliding gates over each compartment control the feed from the pipe. Two compartments are always being loaded while the other two are feeding to the plant.

The box is of timber construction braced with steel rods on a concrete foundation. Each of the four compartments has a capacity of 125 cu. yd. and has eighteen 10-in.-square openings in its sides covered with ½-in.-mesh screen cloth to permit drainage. This water and any other drippage from the bins drain from the concrete floor under the box through flumes back into the dredge pond. The overflow from the top goes through a wooden flume into the pond. A steel partition between compartments protects a drained compartment from the water in an adjoining compartment which is being filled.

Each compartment discharges through two Link-Belt arc gates onto the 36-in. conveyor (No. 1) to the scalping screen. This conveyor runs horizontally under the dewatering box for 50 ft. and is then inclined to the top of the scalper building. This belt conveyor operates on 170-ft. centers and is driven at the rate of 350 ft. per min. by a 40-hp. motor through a Link-Belt silent-chain drive and gear.

Conveyor No. 1 discharges over a sloping rail grizzly 8 ft. long with 1½-in. spacing. The coarse aggregate discharges into the Link-Belt 5-ft. by 24-ft. revolving scalping screen which has 2-in.-mesh wire cloth. The coarse material from the scalper drops through a chute into a surge-bin feeding a crusher. The Iowa Mfg. Co. 9-in. by 36-in. jaw crusher is mounted on a concrete footing and is

Crusher and return belt conveyor.



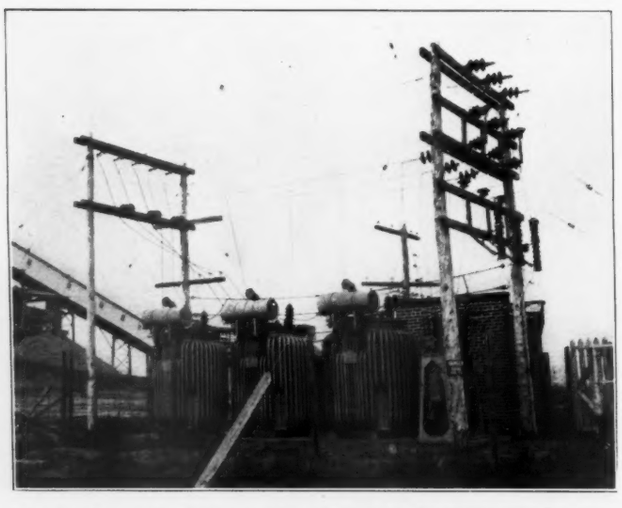
Locomotive and cars at loading building. Screening plant at right.

driven by a 50-hp. motor through a Goodyear drive belt. It discharges onto a 16-in. belt conveyor (No. 5) which feeds back onto belt conveyor No. 1 to the scalping screen. This conveyor is on 60-ft. centers and is driven, at the rate of 275 ft. per min., by a 7½-hp. motor through Link-Belt silent-chain-and-gear drive. The scalping screen is driven by a 30-hp. motor, also through Link-Belt silent-chain-and-gear drive.

The fines from the grizzly and from the scalping screen discharge onto a 36-in. belt conveyor (No. 2) to the screening building. This conveyor operates on 180-ft. centers and is driven at the rate of 350 ft. per min. by a 50-hp. motor through Link-Belt silent-chain-and-gear drive. Gutta Percha belting is used on this conveyor.

Conveyor No. 2 discharges into a chute where wash water is added. The material then passes over ¼-in. perforated plates to remove some of the sand and through a split chute feeding the first pair of sizing screens. Seven single-deck Hum-mer double vibrating screens size all of the material. The first pair of 4-ft. by 8-ft. screens has 1-in.-mesh wire cloth. The oversize is chuted to another Hum-mer screen of the same size with 1½-in. cloth. The two sizes—1-in. to 1½-in. and 1½-in. to 2⅜-in. —produced by this screen are chuted directly into bins.

The material passing through the first pair of Hum-mer screens drops onto chutes with ¼-in. perforations which help to separate out the sand. The material passing over these plates feeds to another pair of 4-ft. by 8-ft. Hum-mer screens with ⅜-in. cloth. The oversize—⅜-in. to 1-in.—from these screens is chuted into a bin. The material passing through these screens goes to a third pair of Hum-mer screens. These are 4 ft. by 6 ft. and have 5/16-in. perforations. The oversize—¼-in. to ⅜-in.—goes to a bin. The throughs go through a chute with ¼-in. perforations into another bin. The material going through these perforations goes into a waste flume. The sand passing through the other ¼-in. perforated plates goes to two timber sand-flumes of the company's own design which discharge the coarse and fine sands into separate bins.



The outdoor sub-station employs three single-phase transformers.

The seven-compartment bin storage has a live storage capacity of about 1,400 tons. At present each bin is walled in on both sides with the timber but changes are to be made during the winter to enlarge the storage capacity. All chutes in the plant are covered and are steel-lined except where there is impact. Rubber chute lining is used at these points.

The bins discharge through gates onto a 36-in. belt conveyor (No. 3) in a concrete tunnel beneath.

Scale for weighing trucks in the loading building.

Any desired mixture of sizes can be made here. The conveyor is slightly inclined for 90 ft. in the tunnel and then slopes more steeply for the remaining 100 ft. of its length to the loading building. This conveyor is driven at the rate of 350 ft. per min. by a 40-hp. motor through a Link-Belt silent-chain drive. Goodyear conveyor belting is used.

This conveyor discharges through a perforated chute onto a Link-Belt 36-in. horizontal shuttle belt conveyor over the loading track. This is on 40-ft. centers and allows a car to be uniformly loaded without moving the car. It is driven at the rate of 350 ft. per min. by a 5-hp. motor through Link-Belt silent-chain drive. A Plymouth 24-ton gasoline locomotive spots the cars and does all switching in the yards. The cars are weighed on a Fairbanks 120-ton-capacity track scale.

Wash water for the plant is supplied from the lake by a Moore 10-in. centrifugal pump driven through a Moore flexible coupling by a Westing-

(*Continued on page 39*)

Effect of Grading of Gravel and Sand on Voids and Weights—Part I*

By STANTON WALKER
Director, Engineering and Research Division, National Sand and Gravel Assn.

THE void content of sand and gravel is of interest in the consideration of a great many different uses of these materials; the weight is also of interest, but principally on account of its relationship to the voids. Probably most attention has been paid to voids in the consideration of concrete and bituminous mixtures, but they are also of significance in connection with studies of other uses.

In concrete, while the full significance of the relationship of the voids to the concrete-making properties of the aggregate has not been developed, they are known to be of importance. They have a direct bearing on the determination of quantities; they should be considered in fixing the amount of mortar required for workability; the quantity of cement required for a volume of concrete of given proportions is a direct function of the voids. In bituminous mixtures the voids are an important factor in determining the stability of the product and in fixing the amount of bitumen. Studies of gravel ballast being carried out in the National Sand and Gravel Assn. laboratory take the voids into account. In studies of foundry sands, filter sands, and filter gravel, voids are worthy of consideration.

In order that comprehensive information about the effect of grading of sand and gravel on its void content might be available, tests were carried out in the research laboratory of the National Sand and Gravel Assn. during 1928 on one gravel and two sands for a wide range of gradings. These tests are preliminary to studies of gravel ballast, voids in different combinations of sand and gravel and the effect of these combinations on the strength, yield and workability of concrete. While the present tests, in the absence of the results of the subsequent investigation, do not furnish a basis for a discussion of the effect of voids, they do provide comprehensive information on the effect of grading on void content which should be of considerable value.

This paper gives a complete report of the tests made in the National Sand and Gravel Assn.'s laboratory and in addition includes two appendices as follows:

1. Effect of Ratio of Sand to Coarse Aggregate on Voids and Weight. These data are from hitherto unpublished tests of the Structural Materials Research Laboratory, Lewis Institute, Chicago, Ill. They were released for this purpose by F. R. McMillan, director of research of the Portland Cement Assn.

2. Effect of Moisture Content of Sand on Voids. C. E. Proudley has summarized some of the more important published data showing relationships between moisture content of sand and bulking.

Materials and Test Methods

The tests on the two sands and one gravel were carried out under the immediate supervision of C. E. Proudley. The voids and weights per cubic foot of three aggregates were determined for a wide range in grading. The aggregates tested were the following:

1. Gravel from the Potomac River.
2. Sand from the Potomac River.
3. Sand from the Massaponax Sand & Gravel Corp., Bowie, Md. The gravel was separated into four sizes, as follows:
   1. No. 8 to No. 4.
   2. No. 4 to ⅜-in.
   3. ⅜-in. to ¾-in.
   4. ¾-in. to 1½-in.

These sizes were recombined into 57 different gradings. Most of the tests were made with the three coarser sizes; the combinations were selected so that the voids and unit weights can be determined by interpolation for any combination of these three sizes and a limited number of the four sizes.

Each of the two sands was separated into three different sizes as follows:

1. Fine (approximately 0 to No. 48).
2. Medium (approximately No. 48 to No. 14).
3. Coarse (approximately No. 14 to No. 4.)

(No. 48 is the same as No. 50, and No. 14 is the same as No. 16.)

These sizes were recombined into 51 different gradings, arranged in such a manner that the voids and unit weights may be determined for any combination of them.

The weights per cubic foot were determined in measures cylindrical in shape with height approximately equal to diameter. A measure of ½-cu. ft. capacity was used for the gravel tests and one of 1/5-cu. ft. capacity for the tests with sand. The weights were determined on a platform scale sensitive to 0.01 lb. Tests were made for two methods of filling the measure—"dry and loose" and "dry and rodded." Two or three tests were made for each grading.

In the "dry and loose" determinations, the gravel or sand was placed in the measure without compacting; it was allowed to flow into it from a shovel held level with its top. About five shovelfuls were required to fill the measure. The aggregate was struck off level with the top before it was weighed.

The "dry and rodded" determinations were made in accordance with the "Standard Method of Test for Unit Weight of Aggregate for Concrete" of the American Society for Testing Materials (serial des-

* Reprinted from *National Sand and Gravel Bulletin*, Sept. 15, 1930.

UNIVERSITY OF MICHIGAN LIBRARIES

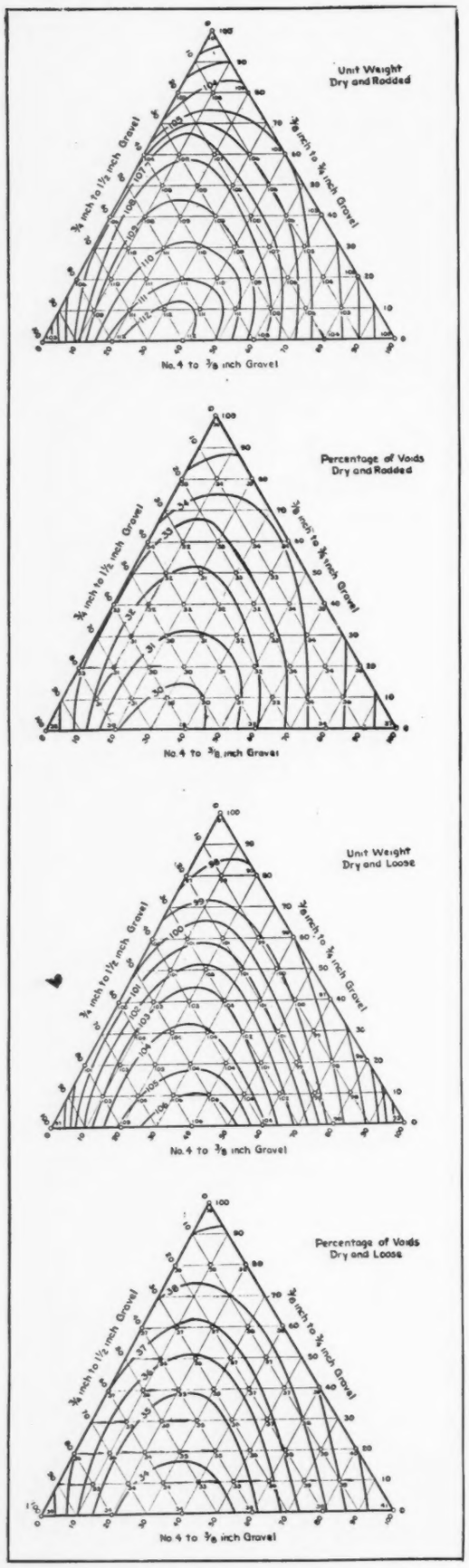


Fig. 1. Unit weight and void content of Potomac River gravel. See Table I at the right for complete details of data.

ignation C29-27). This method of test requires that the aggregate be placed in the measure in three equal layers and that each layer be rodded 25 to 30 times with a 5/8-in. round bullet-pointed rod.

The voids were computed from the unit weights and the apparent specific gravity using the following formula:

$$V = 1 - \frac{W}{62.5\ S} \qquad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

V = Volume of voids in a unit volume of aggregate.

Table I. EFFECT OF GRADING OF GRAVEL ON UNIT WEIGHTS AND VOIDS

Aggregate: Rounded gravel from the Potomac River. Voids computed from unit weights and apparent specific gravity; average apparent specific gravity, 2.55. Each value is the average of two or three tests.

Grading No.	Amount of Each Size (*per cent*)				Unit Weight (*lb. per cu. ft.*)		Voids (*per cent*)	
	No. 8 to No. 4	No. 4 to 3/8 in.	3/8 in. to 3/4 in.	3/4 in. to 1 1/2 in.	Loose	Rodded	Loose	Rodded
Combinations of Two Sizes								
1	0	0	0	100	97	103	.39	.35
2	0	0	20	80	101	107	.37	.33
3	0	0	40	60	100	106	.38	.33
4	0	0	60	40	100	104	.37	.35
5	0	0	80	20	97	103	.39	.35
6	0	0	100	0	97	101	.39	.36
6	0	0	100	0	97	101	.39	.36
7	0	20	80	0	98	104	.38	.35
8	0	40	60	0	99	105	.38	.34
9	0	60	40	0	97	103	.39	.35
10	0	80	20	0	96	102	.40	.36
11	0	100	0	0	93	100	.41	.37
11	0	100	0	0	93	100	.41	.37
12	0	80	0	20	98	104	.38	.35
13	0	60	0	40	104	108	.35	.32
14	0	40	0	60	106	113	.34	.29
15	0	20	0	80	105	112	.34	.30
1	0	0	0	100	97	103	.39	.35
Combinations of Three Sizes								
16	0	10	10	80	103	109	.35	.31
17	0	20	10	70	104	111	.35	.31
18	0	30	10	60	106	112	.34	.30
19	0	40	10	50	106	111	.33	.30
20	0	50	10	40	104	111	.35	.31
21	0	60	10	30	103	108	.36	.33
22	0	70	10	20	98	106	.39	.34
23	0	80	10	10	98	103	.39	.36
2	0	0	20	80	101	107	.37	.33
24	0	10	20	70	103	110	.36	.31
25	0	20	20	60	105	111	.34	.30
26	0	30	20	50	104	111	.35	.30
27	0	40	20	40	104	110	.35	.31
28	0	50	20	30	101	109	.36	.32
29	0	60	20	20	99	106	.38	.34
30	0	70	20	10	98	104	.39	.35
10	0	80	20	0	96	102	.40	.36
31	0	10	30	60	104	110	.35	.31
32	0	20	30	50	104	111	.35	.31
33	0	30	30	40	104	110	.35	.31
34	0	40	30	30	102	109	.36	.32
35	0	50	30	20	101	107	.37	.33
36	0	60	30	10	99	105	.38	.34
3	0	0	40	60	100	106	.38	.33
37	0	10	40	50	103	108	.36	.32
38	0	20	40	40	103	109	.35	.32
39	0	30	40	30	104	109	.35	.32
40	0	40	40	20	101	108	.37	.32
41	0	50	40	10	100	106	.37	.34
9	0	60	40	0	97	103	.39	.35
42	0	10	50	40	101	108	.36	.32
43	0	20	50	30	103	109	.36	.31
44	0	30	50	20	101	106	.37	.33
45	0	40	50	10	100	106	.37	.33
4	0	0	60	40	100	104	.37	.35
46	0	10	60	30	101	108	.37	.32
47	0	20	60	20	101	107	.37	.33
48	0	30	60	10	99	106	.38	.34
8	0	40	60	0	99	105	.38	.34
5	0	0	80	20	97	103	.40	.35
49	0	10	80	10	99	105	.38	.34
7	0	20	80	0	98	104	.38	.35
Combinations of Four Sizes								
*	0	0	50	50	101	105	.37	.34
50	10	0	45	45	105	111	.34	.31
51	20	0	40	40	107	113	.33	.29
52	10	10	40	40	105	111	.34	.30
53	20	10	35	35	106	113	.33	.29
54	10	20	35	35	106	112	.37	.30
55	20	20	30	30	107	113	.33	.29
56	10	30	30	30	105	111	.34	.30
57	20	30	25	25	105	110	.34	.31

W = Weight of a cubic foot of aggregate in pounds.
S = Apparent specific gravity of aggregate.
62.5 = Weight of a cubic foot of water in pounds.

The volume of voids multiplied by 100 gives the percentage of voids.

Explanations of Tables and Diagrams

The complete data of the tests are given in the five tables and three diagrams included in this report. The following description of the tables and diagrams will assist in the understanding of the discussion of the test data.

Table I gives the voids and unit weights of the different combinations of gravel. It will be observed that the data in the table are divided into three groups: the first giving the combinations of two sizes; the second, combinations of three sizes; and the third, combinations of four sizes.

Table II gives the data of voids and unit weights for

Table II. EFFECT OF GRADING OF SAND ON UNIT WEIGHT AND VOIDS

Aggregate: Sand from Massaponax Sand & Gravel Corp., Bowie, Md. Voids computed from unit weights and apparent specific gravity; average apparent specific gravity, 2.63. Corrected percentages computed from sieve analyses in Table III. Each value is the average of 2 or 3 tests.

Grading No.	Proportions (*per cent of each size*)						Fineness Modulus	Unit Weight (*lb. per cu. ft.*)		Voids (*per cent*)	
	Nominal			Corrected				Loose	Rodded	Loose	Rodded
	Fine	Med.	Coarse	0 to 48	48 to 14	14 to 4					
Combinations of Two Sizes											
1	0	0	100	0	4	96	4.41	91	98	45	40
2	0	20	80	1	21	78	3.94	98	104	40	37
3	0	40	60	2	39	59	3.58	98	105	40	36
4	0	60	40	3	59	38	3.13	95	102	42	38
5	0	80	20	4	77	19	2.70	91	99	44	40
6	0	100	0	4	96	0	2.26	86	94	47	42
6	0	100	0	4	96	0	2.26	86	94	47	42
7	20	80	0	23	77	0	1.96	90	98	45	40
8	40	60	0	42	58	0	1.66	91	100	44	39
9	60	40	0	61	39	0	1.36	93	101	43	38
10	80	20	0	80	20	0	1.11	88	98	46	40
11	100	0	0	96	4	0	0.86	84	95	48	42
11	100	0	0	96	4	0	0.86	84	95	48	42
12	80	0	20	77	4	19	1.57	93	102	43	38
13	60	0	40	57	4	39	2.28	101	109	38	33
14	40	0	60	38	4	58	2.99	105	113	36	31
15	20	0	80	19	4	77	3.70	102	109	38	33
1	0	0	100	0	4	96	4.41	91	98	45	40
Combinations of Three Sizes											
16	10	10	80	10	13	77	3.85	98	106	40	36
17	20	10	70	19	14	67	3.50	102	110	38	33
18	30	10	60	29	13	58	3.14	104	112	36	32
19	40	10	50	38	14	48	2.78	103	113	37	31
20	50	10	40	48	14	38	2.43	102	111	38	33
21	60	10	30	58	13	29	2.08	97	106	41	36
22	70	10	20	67	14	19	1.72	95	104	42	37
23	80	10	10	77	13	10	1.36	90	100	45	39
2	0	20	80	1	21	78	3.94	98	104	40	37
24	10	20	70	11	20	69	3.59	101	107	38	35
25	20	20	60	21	20	59	3.23	105	112	36	32
26	30	20	50	31	20	49	2.88	105	112	36	32
27	40	20	40	41	20	39	2.52	103	111	37	33
28	50	20	30	50	21	29	2.17	100	108	39	34
29	60	20	20	60	20	20	1.82	96	105	41	36
30	70	20	10	70	20	10	1.46	92	101	44	38
10	80	20	0	80	20	0	1.11	88	98	46	40
31	10	30	60	11	30	59	3.39	102	108	38	34
32	20	30	50	21	30	49	3.03	104	111	37	32
33	30	30	40	31	30	39	2.68	104	111	37	32
34	40	30	30	41	30	29	2.32	101	109	39	33
35	50	30	20	51	29	20	1.97	96	104	42	37
36	60	30	10	60	30	10	1.62	94	102	43	38
3	0	40	60	2	39	59	3.58	98	105	40	36
37	10	40	50	11	40	49	3.21	102	108	38	34
38	20	40	40	21	40	39	2.84	102	108	38	34
39	30	40	30	31	40	29	2.47	101	108	38	34
40	40	40	20	41	39	20	2.10	99	106	40	35
41	50	40	10	51	39	10	1.73	96	103	42	37
9	60	40	0	61	39	0	1.36	93	101	43	38
42	10	50	40	12	49	39	3.00	99	106	40	36
43	20	50	30	22	49	29	2.63	100	107	39	35
44	30	50	20	32	48	20	2.26	98	106	40	35
45	40	50	10	42	48	10	1.89	96	105	41	36
4	0	60	40	3	59	38	3.13	95	102	42	38
46	10	60	30	13	58	29	2.76	97	103	41	37
47	20	60	20	23	58	19	2.40	97	104	41	37
48	30	60	10	33	57	10	2.03	94	102	42	38
8	40	60	0	42	58	0	1.66	91	100	44	39
49	10	70	20	13	68	19	2.55	94	102	42	38
50	20	70	10	23	67	10	2.18	92	101	44	39
5	0	80	20	4	77	19	2.70	91	99	44	40
51	10	80	10	14	76	10	2.33	91	99	44	40
7	20	80	0	23	77	0	1.96	90	98	45	40

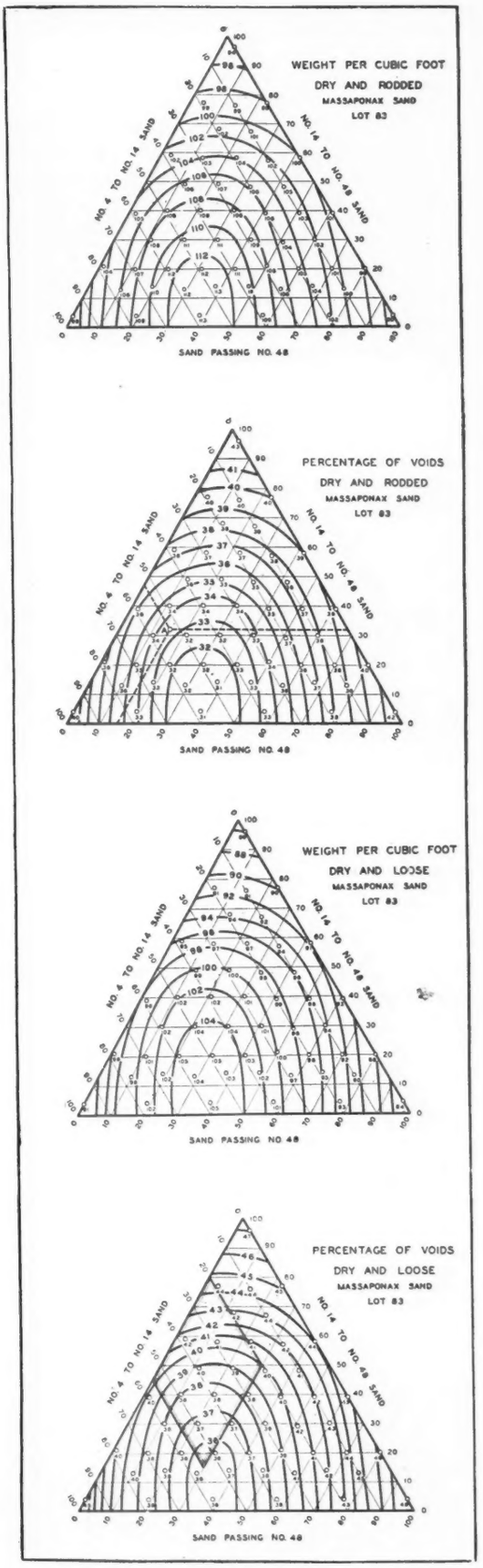


Fig. 2. Unit weight and void content of sand from the Massaponax Sand and Gravel Corp. plant at Bowie, Md.

UNIVERSITY OF MICHIGAN LIBRARIES

the sand from the Massaponax Sand and Gravel Corp. plant at Bowie, Md. These data are divided into two groups—combinations of two sizes and of three sizes. Two sets of percentages showing the grading of the sand will be noted. The first set (columns 2, 3 and 4) gives the proportions of the nominal sizes (fine, medium and coarse) used. The separation of sand into these sizes was not exact and, in order to obtain the percentages of the definite sizes, it was necessary to apply a correction to the first set of percentages, based on sieve analyses of the different sizes. The sieve analyses used in making the corrections for the Massaponax sand are given in Table III.

Table IV gives the data for the Potomac River sand, and Table V gives the sieve analyses used in determining the corrected proportions.

Figs. 1, 2 and 3 give the data of voids and unit weights in graphical form for the gravel, Massaponax sand and Potomac River sand, respectively. These diagrams are most useful in visualizing the trends of the data and pointing out their significance. However, since charts of the nature represented by them are somewhat uncommon, an explanation of the method of reading them is desirable.

These charts employ "triaxial coordinates," which are convenient for studying data including four variables, three of which are interdependent and with their sums a constant. It will be seen that these data meet this condition. The four variables are the following:

1. Percentage of fine size.
2. Percentage of medium size.
3. Percentage of coarse size.
4. Voids or unit weight.

The first three factors are interdependent and the sum is always the same—100 per cent.

The method of constructing the diagram is to use the triangle to fix the position of the points representing various proportions of sizes (the first three variables) and to draw contour lines through these points representing the voids or unit weights. For example, the path of a contour passes through the points representing the combinations having the same voids or unit weights.

The method of reading the chart can be most conveniently explained by referring to the diagram in Fig. 2, which shows the voids for the dry and rodded Massaponax sand (second diagram from the top). Point A on that diagram represents a combination of various sizes of sand consisting of:

15 per cent sand passing No. 48.
32 per cent sand between No. 14 to No. 48.
53 per cent sand between No. 4 to No. 14.

These percentages are to be read at the sides of the triangle by following the dotted lines. Observe that these dotted lines are parallel to the numbers at the sides of the charts showing percentages. The percentage of voids will be found by interpolating between the contours; in this case it is about 33½ per cent.

As an additional explanation, observe that the lower left corner of the triangle represents 100 per cent of the No. 4 to 14 sizes; the lower right corner, 100 per cent of the sand passing No. 48; and the top corner, 100 per cent of the No. 14 to No. 48 size. The numbers about the sides of the triangle show percentages have been printed in such a position as to guide the eye in the correct direction. For example, any point within the diagram is fixed by three intersecting lines. If the percentages at the sides of the triangle which are printed in line with these lines are read, the proportion of the different sizes will be determined. There will be little chance of error if it is remembered that the percentages to read correctly must always total 100.

It should be pointed out that similar charts which have been published are constructed somewhat differently and, therefore, require a different procedure to read the percentages. However, the principles are the same and the construction used here is considered as the most convenient. Attention is called to the other methods to warn the reader against allowing himself to become confused.

Voids and Unit Weights for Gravel

The voids were computed from the unit weights, and therefore are a direct function of them. Since the voids are probably the factor of most interest the discussion which follows has been restricted to a consideration of them. It applies equally well, however, to the weights except that the changes are in the opposite direction; that is, where the voids are said to decrease the weights would increase. It may be of interest to keep in mind that a weight per cubic foot of 100 lb. is represented by a void content of 37 per cent for the gravel and 38 per cent for the sands, and that each change of 3 in the percentage of voids represents a change in weight of about 5 lb. per cu. ft.; a decrease in voids represents an increase in weight.

Table III. SIEVE ANALYSES OF DIFFERENT SIZES OF MASSAPONAX SAND

See Table II for unit weights and voids of different combinations of the three sizes. A. Sieve analyses used for combinations No. 1 and 11 to 23 inclusive in Table II. B. Sieve analyses used for combinations No. 2, 10, and 24 to 36 inclusive in Table II. C. Sieve analyses used for combinations No. 3, 9, and 37 to 45 inclusive in Table II. D. Sieve analyses used for combinations No. 4 to 8, and 46 to 51 inclusive in Table II.

Sieve No.	Size of Clear Opening (*in.*)	Amounts Coarser Than Each Sieve (*per cent by weight*)											
		Fine Sand				Medium Sand				Coarse Sand			
		A	B	C	D	A	B	C	D	A	B	C	D
100	0.0058	82	79	74	75	100	100	100	100	100	100	100	100
48	0.0116	4	1	1	1	96	97	96	96	100	100	100	100
28	0.0232	0	0	0	0	39	37	33	30	100	99	100	100
14	0.046	0	0	0	0	0	0	0	0	96	98	98	96
8	0.093	0	0	0	0	0	0	0	0	44	38	47	48
4	0.185	0	0	0	0	0	0	0	0	0	0	0	0
Fineness Modulus*		.86	.80	.75	.76	2.35	2.34	2.29	2.26	4.40	4.35	4.45	4.44

*Sum of percentages in sieve analyses, divided by 100.

A study of the data in Table I and Fig. 1 shows that the percentage of voids in gravel, graded between the No. 4 and 1½-in. sieves may be changed about 8 by varying the proportions of the three sizes. For measurements in a dry and loose condition the minimum void content found was 33 per cent and the maximum, 41 per cent; for the dry and rodded measurements the range was from 29 to 37 per cent. The minimum voids were obtained with combinations of the smaller (No. 4 to ⅜-in.) and larger (¾-in. to 1½-in.) sizes, with the intermediate size omitted. As would be expected, the maximum voids were found in gravel of one size; each of the three sizes (No. 4 to ⅜-in., ⅜-in. to ¾-in., and ¾-in. to 1½-in.) gave about the same results.

General laws which may be derived from these data, showing the effect of grading on voids, are not at once obvious. However, the application of the data in the table and diagrams will be made clear by pointing out certain significant facts.

The minimum voids were obtained with combinations of the No. 4 to ⅜-in. and the ¾-in. to 1½-in. sizes consisting of 30 to 40 per cent of the finer size and 60 to 70 per cent of the coarser size. No proportions of the three sizes gave voids as low as found for this combination. The addition of the intermediate size to the above combination caused increases in voids. This may be seen by referring to Fig. 1. For example, on the second diagram draw a straight line between the points representing 35 per cent of the No. 4 to ⅜-in. size and 65 per cent of the ¾-in. to 1½-in. size, to the point representing 100 per cent of the intermediate size (⅜-in. to ¾-in.) All points on the line represent combinations in which the proportions of the finer and coarser sizes are in the ratio of 35 to 65; the proportions of the intermediate size expressed as a per cent of the whole are given by following the horizontal lines to the right. It will be seen, for example, that the addition of 30 per cent of the intermediate size increased the voids from about 29 to 31 per cent.

For mixtures of ⅜-in. to ¾-in. and ¾-in. to 1½-in. gravel, the minimum voids were obtained for combinations consisting of 30 to 40 per cent of the finer size and 60 to 70 per cent of the coarser. However, the percentage of voids was changed only a small amount (about 2 per cent) by changes in proportions of these two sizes. Reference to the second diagram in Fig. 1 will show that the addition of the finer size (No. 4 to ⅜-in.) to this combination up to 30 to 40 per cent decreased the voids. This relationship is best illustrated by the device of drawing a line as described previously except that, in this case, it should be drawn from the point representing 35 per cent of ⅜-in. to ¾-in. and 65 per cent of ¾-in. to 1½-in. sizes (on the left edge of the triangle) to the point representing 100 per cent of the No. 4 to ⅜-in. size (lower left corner).

Combinations of the No. 4 to ⅜-in. and ⅜-in. to ¾-in. sizes showed about the same range as for the combinations of the two coarser sizes discussed above. The minimum voids for these two sizes were given with a mixture consisting of 30 to 40 per cent of the finer size, but the maximum range was only about 3 per cent of voids. The addition of the coarser size (¾-in. to 1½-in.) to this combination (say 35 per cent 4-in. to ⅜-in. and 65 per cent ⅜-in. to ¾-in.) up to about 60 to 70 per cent tended to decrease the voids somewhat. The second diagram in Fig. 1 shows a decrease from 34 to about 31 per cent for the dry and rodded measurements. Similarly, the bottom diagram in Fig. 1 will show a reduction from about 39 to 35 per cent for the dry and loose measurements.

In the discussion given above the recurrence of the approximately 35 to 65 per cent combination of a smaller and larger size as giving the least voids will have been noted. This and further study of these data lead to the general observation that, for the sizes used in these tests, the addition of a finer material up to 30 to 40 per cent or a coarser material up to 60 to 70 per cent operated to decrease the voids. The amount of the decrease depends on the combinations involved.

It is of interest to the user and producer of gravel to point out specifically that the addition up to about 30 to 40 per cent of No. 4 to ⅜-in. size gravel to any combination of ⅜-in. to 1½-in. gravel will cause a decrease in voids. The actual percentage of voids which will be obtained, however, will depend on the proportions of sizes in the ⅜-in. to 1½-in. material. For example, averages of the dry-and-rodded and dry-and-loose measurements will show 30 to 40 per cent of the No. 4 to ⅜-in. size producing voids ranging from 31 per cent where the larger material is all coarser than ¾-in. to about 35 per cent where the larger material is finer than ⅜-in.

Only a few tests were made in which the No. 8 to No. 4 size was added. These are shown in the third group of Table I. For the few combinations tested, the data show, in general, that the addition of this finer size up to 20 per cent, the limit of the tests, decreased the void content.

It should be emphasized that the combinations which give the least voids for the gravel do not necessarily represent the best combinations from the viewpoint of strength of concrete. They do, however, represent combinations which will give the greatest yield of concrete. The further investigations which have been outlined will give information regarding strength. Attention is also directed to the void and unit-weight determinations on combinations of sand and coarse aggregate reported in Appendix I. [This will be published in a subsequent issue.—Editor.]

Discussion of Voids in Sand

Table II and Fig. 2 give the results of the tests on the Massaponax sand. The marked similarity of the contours for this sand to those for the gravel in Fig. 1 will be observed. This similarity is to be expected since they represent similar data for combinations of granular materials of a similar range but different magnitude of sizes.

Much the same discussion can be written for the data of this sand as for the gravel. The minimum

UNIVERSITY OF MICHIGAN LIBRARIES

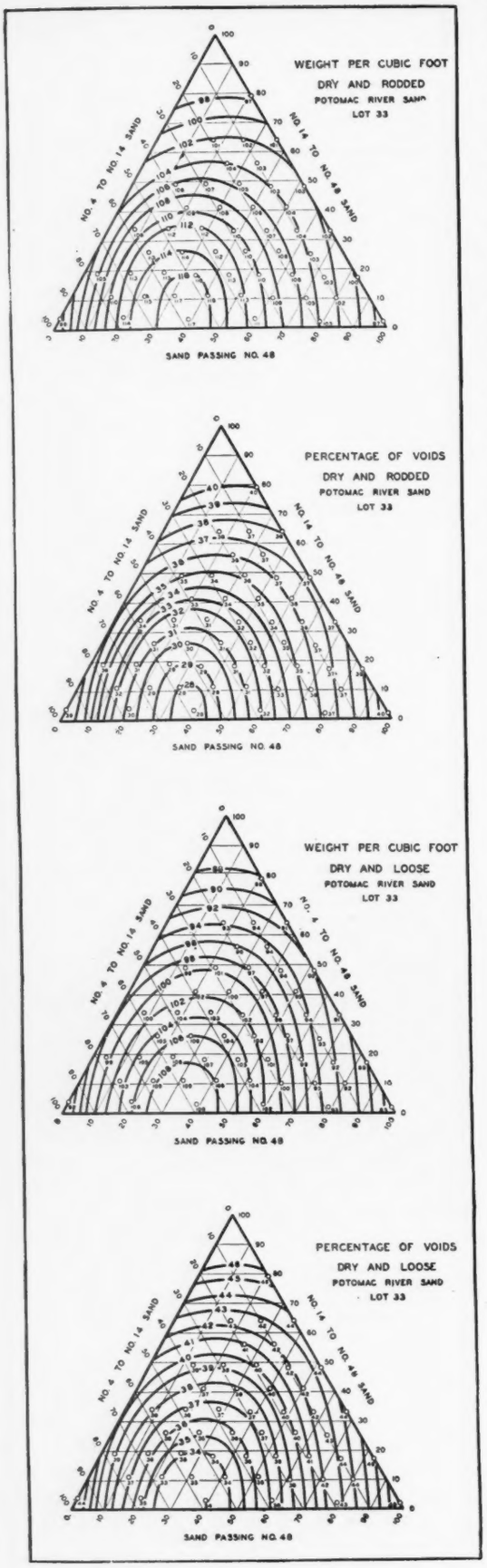


Fig. 3. Unit weight and void content of Potomac River sand. See Table IV at the right for complete details of data.

voids were obtained for a combination of the fine and coarse sizes, omitting the intermediate. Combinations of two adjacent sizes (that is, fine and intermediate or intermediate and coarse) showed a comparatively small range in voids. As in the case of the gravel the addition of a finer size up to about 40 per cent or of a coarser size up to about 60 per cent, within the limits of the sizes used in these tests, caused a decrease in voids.

Attention is called to the bottom diagram in Fig. 2. The partially cross-hatched area represents the approximate limits of the usual specification for sand for concrete. It will be noted that the least voids are obtained for the combinations containing the least amount of the intermediate size and the largest amounts of the fine and coarse size. This statement is made as a matter of interest; too much significance should not be attached to it, as it does not necessarily follow that combinations of this nature are best for concrete.

Table IV. EFFECT OF GRADING OF SAND ON UNIT WEIGHT AND VOIDS

Aggregate: Potomac River sand. Voids computed from unit weights and apparent specific gravity; average apparent specific gravity, 2.61. Corrected percentages computed from sieve analyses in Table V. Each value is the average of 2 or 3 tests.

Grading No.	Proportions (*per cent of each size*)						Fineness Modulus	Unit Weight (*lb. per cu. ft.*)		Voids (*per cent*)	
	Nominal			Corrected				Loose	Rodded	Loose	Rodded
	Fine	Med.	Coarse	0 to 48	48 to 14	14 to 4					
Combinations of Two Sizes											
1	0	0	100	0	4	96	4.50	92	99	44	39
2	0	20	80	4	19	77	4.00	99	105	39	36
3	0	40	60	8	34	58	3.50	100	108	39	34
4	0	60	40	13	49	38	3.00	99	106	39	35
5	0	80	20	17	64	19	2.50	93	101	43	38
6	0	100	0	21	79	0	2.00	88	97	46	40
6	0	100	0	21	79	0	2.00	88	97	46	40
7	20	80	0	36	64	0	1.75	91	101	44	38
8	40	60	0	52	48	0	1.50	92	103	44	37
9	60	40	0	67	33	0	1.25	91	102	44	37
10	80	20	0	83	17	0	1.00	88	100	46	39
11	100	0	0	98	2	0	0.75	85	97	48	40
11	100	0	0	98	2	0	0.75	85	97	48	40
12	80	0	20	79	2	19	1.50	93	103	43	37
13	60	0	40	59	3	38	2.25	102	111	38	32
14	40	0	60	39	3	58	3.00	108	117	34	28
15	20	0	80	19	4	77	3.75	106	114	35	30
1	0	0	100	0	4	96	4.50	92	99	44	39
Combinations of Three Sizes											
16	80	10	10	80	10	10	1.25	92	102	44	37
17	70	10	20	71	10	19	1.62	95	105	42	36
18	60	10	30	61	10	29	2.00	100	109	39	33
19	50	10	40	51	11	38	2.37	104	113	36	31
20	40	10	50	41	11	48	2.75	108	116	34	29
21	30	10	60	31	11	58	3.12	109	117	33	28
22	20	10	70	22	11	67	3.50	109	115	33	29
23	10	10	80	12	11	77	3.87	103	110	37	32
10	80	20	0	83	17	0	1.00	88	100	46	39
24	70	20	10	73	17	10	1.37	92	103	44	37
25	60	20	20	63	18	19	1.75	96	106	41	35
26	50	20	30	53	18	29	2.12	101	110	38	32
27	40	20	40	44	18	38	2.50	105	113	36	31
28	30	20	50	34	18	48	2.87	107	116	34	29
29	20	20	60	24	19	57	3.25	106	115	35	29
30	10	20	70	14	19	67	3.62	105	113	36	31
2	0	20	80	4	19	77	4.00	99	105	39	36
31	60	30	10	65	25	10	1.50	93	103	43	37
32	50	30	20	55	26	19	1.87	97	106	40	35
33	40	30	30	45	26	29	2.25	102	110	37	32
34	30	30	40	36	26	38	2.62	104	112	36	31
35	20	30	50	26	26	48	3.00	106	114	35	30
36	10	30	60	16	26	58	3.37	105	113	36	31
9	60	40	0	67	33	0	1.25	91	102	44	37
37	50	40	10	57	33	10	1.62	94	104	42	36
38	40	40	20	48	33	19	2.00	98	107	40	34
39	30	40	30	38	33	29	2.37	102	110	37	32
40	20	40	40	28	34	38	2.75	103	112	37	31
41	10	40	50	18	34	48	3.12	104	112	36	31
3	0	40	60	8	34	58	3.50	100	108	39	34
42	40	50	10	50	41	9	1.75	95	104	42	36
43	30	50	20	40	41	19	2.12	97	106	40	35
44	20	50	30	30	41	29	2.50	100	108	39	34
45	10	50	40	20	41	39	2.87	102	109	37	33
8	40	60	0	52	48	0	1.50	92	103	44	37
46	30	60	10	42	48	16	1.87	94	103	42	37
47	20	60	20	32	49	19	2.25	97	105	40	36
48	10	60	30	22	49	29	2.62	101	107	38	34
4	0	60	40	13	49	38	3.00	99	106	39	35
49	20	70	10	34	56	10	2.00	94	103	42	37
50	10	70	20	25	56	19	2.37	96	104	41	36
7	20	80	0	36	64	0	1.75	91	101	44	38
51	10	80	10	26	64	10	2.12	94	102	42	37
5	0	80	20	17	64	19	2.50	93	101	43	38

Table V. SIEVE ANALYSES OF DIFFERENT SIZES OF POTOMAC RIVER SAND

See Table IV for unit weights and voids of different combinations of the three sizes.

Sieve Size	Size of Clear Opening (in.)	Amounts Coarser Than Each Sieve (*per cent by weight*)		
		Fine	Medium	Coarse
100	.0058	73	99	100
48	.0116	2	79	100
28	.0232	0	22	100
14	.046	0	0	96
8	.093	0	0	54
4	.185	0	0	0
Fineness Modulus*.....		0.75	2.00	4.50

*Sum of percentages in sieve analyses divided by 100.

Table IV and Fig. 3 show the results of the tests for the Potomac River sand. While the contours are exactly similar in shape to those for the Massaponax sand, it will be observed that, generally, somewhat lower percentages of voids were found for it, particularly in combinations where the finer sizes predominated. This is attributed to the somewhat greater quantity of extremely fine material in the Potomac River sand. In this connection the examples given in Table VI should be of interest. This tabulation will serve also to illustrate the relationship between the voids for the two different methods of measurement. There was an approximately constant difference between the voids for the loose and the rodded measurements. This difference amounted to 5 to 7 per cent for both sands.

Concluding Remarks

This report does not pretend to discuss the effect of voids on the suitability of sand and gravel for various purposes. It does contain valuable and comprehensive information on the relationship between grading of sand and gravel and its void content.

The following observations from the tests should be of interest and guide the reader in further studies of the data:

1. For three sizes of sand or gravel, such as used in these tests, the least voids were obtained for a combination of the fine and coarse sizes, with the intermediate size omitted. In general about 30 to 40 per cent of the finer size gave the least voids.

2. Combinations of two adjacent sizes, that is,

Table VI. TYPICAL EXAMPLES OF VOID PERCENTAGES IN SAND

Amount of Each Size of Sand (*per cent*)			Voids in Sand (*per cent*)			
			Loose		Rodded	
O-No. 48	No. 48-No. 28	No. 28-No. 14	Potomac River	Massaponax	Potomac River	Massaponax
40	0	60	33.0	35.0	28.0	31.0
30	20	50	34.0	35.5	29.2	31.6
20	40	40	37.6	37.6	33.0	33.7
10	60	30	41.5	41.0	37.0	37.0
0	80	20	45.6	45.0	40.5	40.0

fine and medium or medium and coarse, showed relatively small changes in void content for the different proportions. However, as in the case of the fine and coarse, a combination of adjacent sizes containing about 30 to 40 per cent of the finer size had a lower void content than other combinations of two adjacent sizes.

3. The general observation may be made that, for the sizes used in these tests, the void content of any size was reduced by the addition of a finer size up to about 40 per cent or of a coarser size up to about 60 per cent.

4. There was an approximately constant difference between the voids as determined by the loose or rodded method. In the case of gravel this difference was 3 to 4 per cent and in the case of sand it was 5 to 7 per cent.

New Canadian Aggregates Plant

(*Continued from page 32*)

house 100-hp. motor. This pump has a capacity of 1,450 gal. per min. at the 75-ft. head against which it is working. The intake is supported from a timber A-frame by a chain hoist. The material is washed at the head of conveyor No. 2, at each vibrating screen, and at the discharge of conveyor No. 3, to insure the removal of all foreign matter and silt. Both Crane and Jenkins valves are used on the water line.

Power is purchased at 26,400 volts, 3-phase, 25-cycles, and feeds from the main line, through a set of switches and lightning arrestors, to the outdoor substation which is owned by the company. Three single-phase transformers reduce the current to 2,200 volts. Some of this current goes direct to the dredge while the remainder is further reduced to 550 volts for all motors other than those on the

Reading from left to right—first row, R. G. Saunders, E. L. Cousins; second row, N. R. Nicoll, Maj. E. M. McLean; top row, J. E. Scott, W. E. Radcliffe.

dredge. Several small transformers about the plant give further reduction for lighting current. The plant and dredge are completely wired for night operation.

The entire plant has push-button controls at each unit as well as in the control rooms. Signals from sirens at various points are used to control the starting and stopping of the plant, the water pump, and the rate of feed from the dewatering box. The loading plant has a separate set of bell and light signals, while the dredge has bell signals. Safety is a primary consideration as all moving machinery

(*Continued on page 43*)

UNIVERSITY OF MICHIGAN LIBRARIES

Omaha Firm Sells Both Central-Mixed and Mixed-in-Transit Concrete

Demands of Particular Construction Job Served Governs Choice of Mixing Method

THE recent completion of a mixed-in-transit plant and the addition of a fleet of Paris Transit truck mixers places the Ready Mixed Concrete Co., of Omaha, Neb., in an excellent position to serve the rapidly growing Omaha market with both central-mixed and mixed-in-transit concrete.

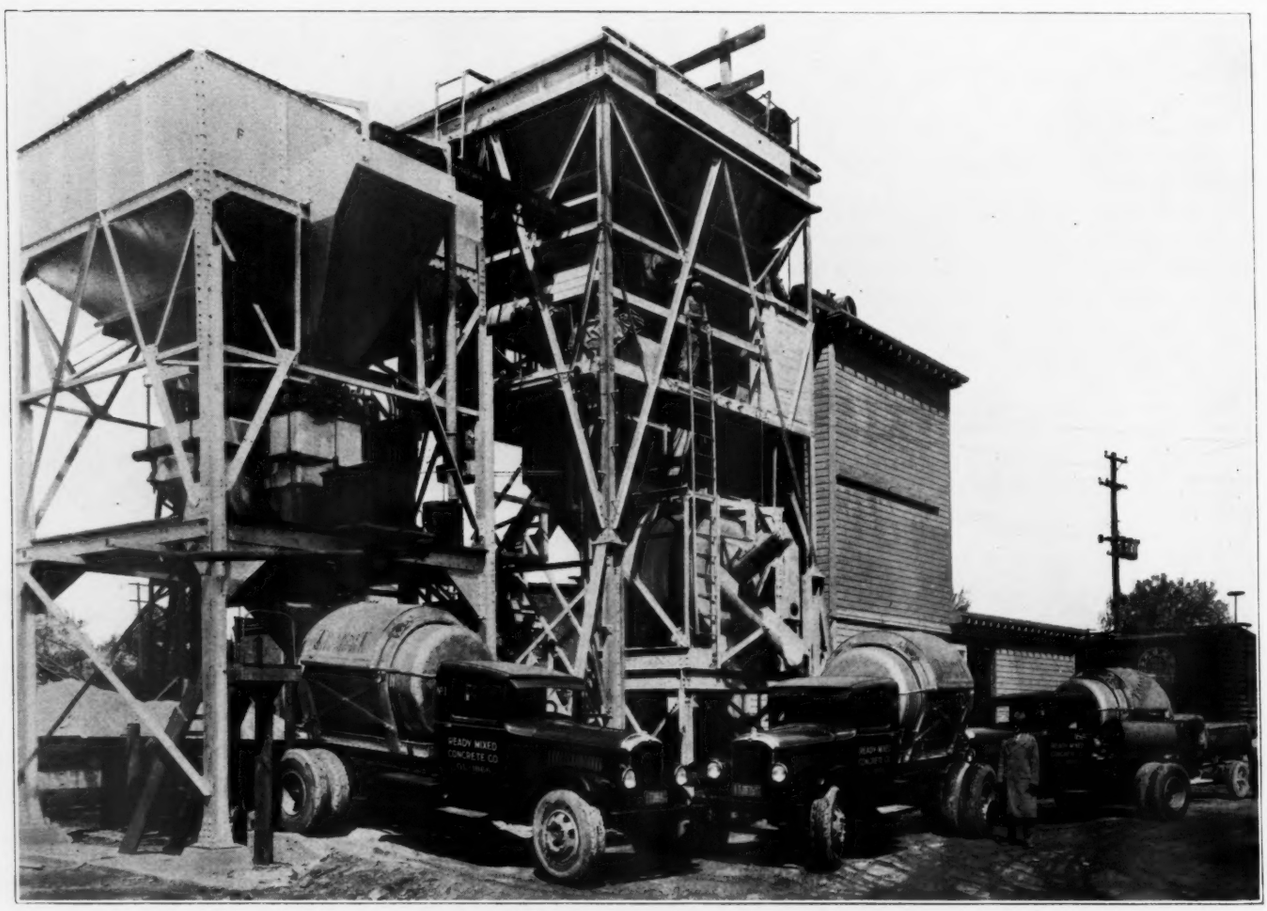
This new service will be especially advantageous in the delivery of concrete for paving and paving-repair jobs and general requirements where the distance requires a long time in transit, or where delays in unloading may be encountered.

The feature of the mixed-in-transit equipment is the complete control of the mixing time and the adaptability to meet unusual conditions. As the truck leaves the plant, the fine and coarse aggregates are carried dry in the mixer drum, the water content being carried in a tank above. Upon reaching the job, or shortly before arrival, the operator engages the mixer drive, opens the water valve to the mixer drum and, after the proper length of time, the freshly mixed concrete is poured into place. Should, for any reason, a delay occur, a mixed-in-transit truck could wait indefinitely before delivery, and any distance could be covered without danger of segregation of aggregates or of the water and cement rising to the top.

As in all modern central or transit plants, the gravity system is used, with the aggregate and cement hopper mounted overhead, materials flowing by gravity to the weighing batchers, and then to the truck-loading chute.

The sand-gravel hopper has a capacity of 75 cu. yd. and has two compartments, each with a lever-operated dumping gate. The hopper is mounted on steel H-beam columns and is adequately braced for rigidity.

Cement is handled from a 20-ton hopper suspended from the sand-gravel hopper and is built to accommodate a screw conveyor which supplies cement from the elevator of the central-mixing plant. The



General view of the plant. Most of the equipment is plainly visible.

Overflow pipe to the cement hopper.

flow of cement is controlled by a dumping gate directly above the cement batcher.

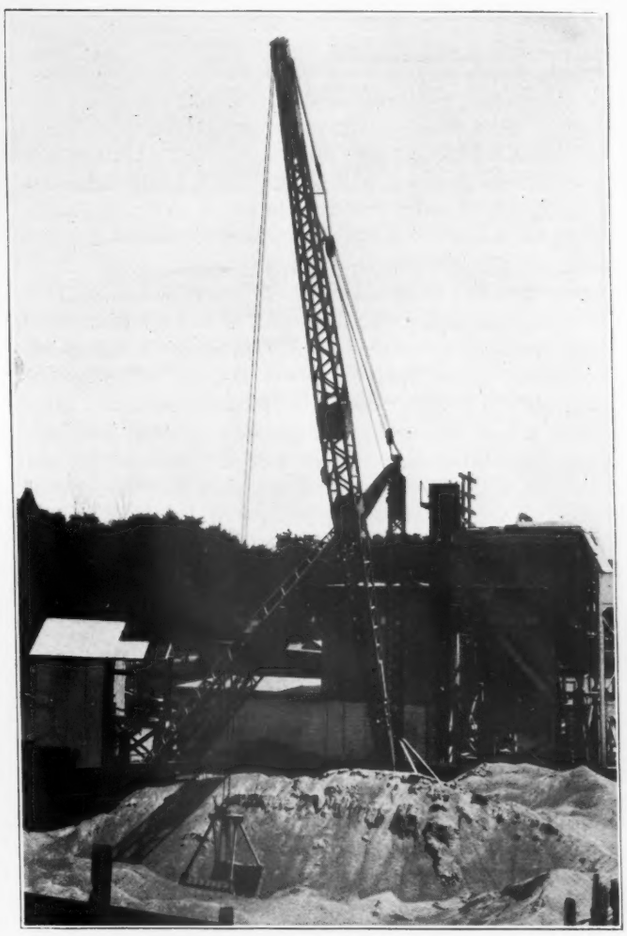
An interesting feature of the batch-hopper equipment is the Winslow scale and timing dial. The timing dial is an auxiliary attachment which indicates the approach of the desired weight and finally the correct weight. It is divided into halves, the left half being the underweight, and the right half the overweight. When the hopper is empty, the pointer remains in the lower section of the underweight half, and as the hopper fills, it approaches a 240-lb. mark which warns the operator to taper off the flow of material. The pointer then approaches the vertical dividing line which is the balancing point of the scale, indicating the desired weight set upon the scale beam has been reached. A great deal of time is saved by this method because overweighing is eliminated. The operator has better control of the flow of the material, permitting greater rapidity in handling the batches. The batch hopper is designed for a capacity of 20,000 lb.

The cement batcher is of similar design, having a capacity of 2,500 lb. It also is equipped with a Winslow scale. The discharge hopper is joined with the discharge of the sand-gravel, having a rounded lip which affords easy entrance to the Paris Transit mixer truck. A small 110-volt vibrator is mounted on the cement discharge hopper to prevent sticking of the cement to the discharge chute.

Water is handled by volumetric control from a square steel tank mounted on the batching platform. A short length of pipe on the inside of the tank is capable of being raised or lowered a full 90 deg., permitting the flow of any desired quantity by merely setting the control lever position on the scale, which is calibrated in 5-gal. units up to 120 gal. All hoppers and batch equipment were built by the Butler Bin Co. of Waukesha, Wis.

Attractive in appearance, the four sturdy trucks which make up the Transit fleet are an excellent advertisement in themselves. Each truck chassis has an enclosed cab and is painted in a soft green contrasting with the flashy aluminum paint of the mixer drum.

Each mixer body consists of a steel drum rotating on rollers which are mounted on an independent frame. A separate drive from the truck transmission and controlled by a lever in the cab provides three speeds of drum rotation. On the inside of the drum, vanes are provided to assist in mixing. Discharge is made through a circular opening in the rear head of the drum. A door with watertight clamps prevents loss of material by splashing. The water tank is shaped in a cylindrical fashion, exactly conforming to the shape of the drum, and is mounted independently above. Control of the flow of water is provided by a valve located near the cab window, the entrance of the water being through a hollow shaft on the front head of the drum. The entire mixer may be elevated to any angle for discharge, by means of a hydraulic hoist.

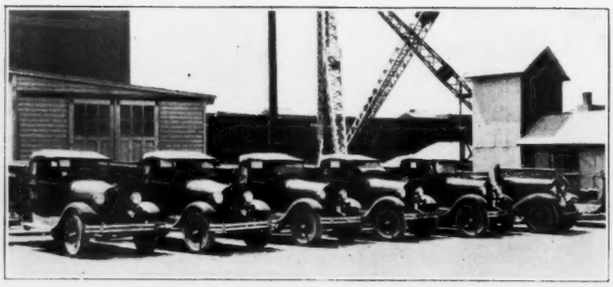


Stiff-leg crane and storage bins.

Three GMC trucks are used, one having a capacity of 3 tons with a Paris Transit B30 truck-mixer which has a capacity of 2 cu. yd., and two being of 5-ton size with Paris Transit A30 truck-

UNIVERSITY OF MICHIGAN LIBRARIES

Fleet of transit-mixed system trucks.



The open-body trucks carrying ready-mixed concrete.

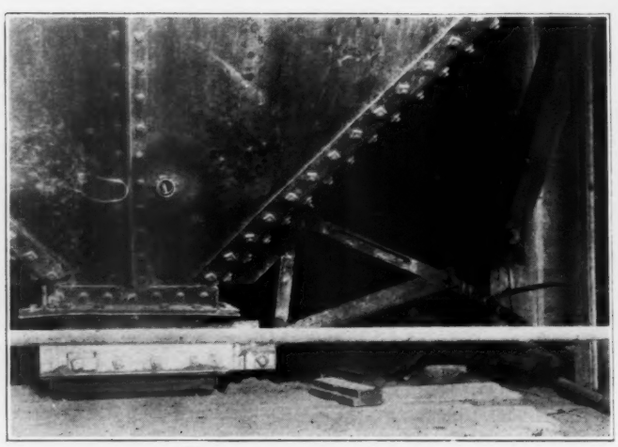
mixers each having a capacity of 3 cu. yd. One 3-ton Mack truck with a Paris Transit B30 truck-mixer is the fourth unit of the fleet.

"Sand-gravel" is the term applied in this area to an aggregate—usually Platte River material—consisting of a sand-and-gravel mixture, all of which will pass a 1-in. screen, 50 per cent of which will be retained on a No. 10 screen. This material, common on the Omaha market, is shipped from nearby Lyman-Richey Sand & Gravel Co. plants in carloads and is unloaded from a private sidetrack by means of an American Hoist & Derrick Co. stiff-leg crane to stock-piles at the rear of the plant. Sufficient space is available to stock about 30 carloads. The crane used has an 80-ft. boom, within easy reach of the entire stock-pile area and the plant hoppers. A 1½-cu. yd. clamshell is used for handling the materials. The crane is powered by a 4-drum American Hoist & Derrick Co. winch, controlled from an enclosed platform mounted above the winch house.

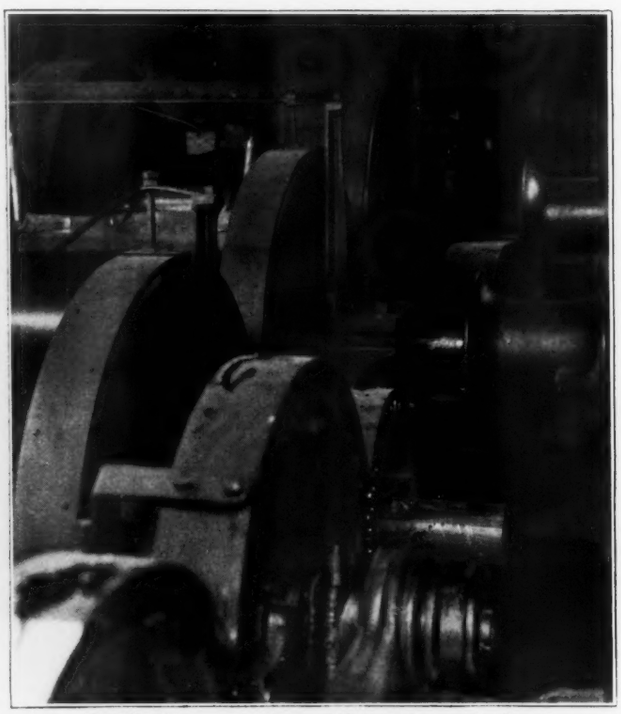
As in general practice, the Ready Mixed Concrete Co. purchases bulk cement in carload quantities, thereby eliminating the annoyance of handling, and accounting for, cement bags. A considerable saving is made in the purchase of cement in this way, provided, of course, that sufficient storage space allows quick unloading to prevent demurrage charges.

This company has an unusual method of handling cement. Essentially the method consists of a continuous loop, with the two plant hoppers on the top and a storage hopper at the bottom, using the bucket elevator as the loop. Cement is unloaded from the cars by means of a power shovel and is dumped into a small receiving hopper at ground level directly in front of the cement-car side-track. This hopper feeds a Caldwell 10-in. screw conveyor, located below the floor of the storage building on ground level, and discharges into the boot of the bucket elevator. Both the power shovel and the screw conveyor are driven from a U. S. Electric Co. 15-hp. motor through a Link-Belt chain drive. The bucket elevator is part of the original central-mixing plant and delivers the cement into the compartment on the top of the plant. Considerable difficulty was encountered in finding a means to transport cement to the new plant without altering the equipment already installed. A Link-Belt 10-in. screw conveyor was finally decided upon and was installed over the cement compartment on the new plant, receiving its cement from a spout at the top of the bucket elevator. An overflow pipe from this conveyor returns the cement to a large hopper in the tower of the storage building. The bucket elevator is a Link-Belt with 7-in. by 7-in. by 11-in. buckets mounted on a chain belt and is driven by a General Electric 25-hp. motor through a pinion-and-gear drive. It is 46 ft. high.

This arrangement permits economical handling of the cement and allows an adequate storage in the



The cement-storage hopper.



Inside the crane house. Note 4-drum winch.

Gravel and cement batchers showing scales and water tank.

L. C. Brandt, foreman.

large tower hopper. When the two plant compartments are filled, the cement automatically overflows into the storage hopper which, in turn, feeds the boot of the bucket elevator. About two cars of cement can be stored in the hopper and the tower.

Delivery of either central or mixed-in-transit concrete is made free of charge anywhere within the Omaha city limits. A charge of 25 cents per cu. yd. per mile is made to any point outside of the city limits.

In addition to a guarantee of prompt delivery service the company guarantees the strength of its product according to the following scale:

		Strength in Lb.	
	Propor-	Ordinary	High Early
No. of Mix	tion	Ready-Mixed	Strength
1	1:4	3,500	3,600
2	1:4½	3,000	3,100
3	1:5	2,500	2,600
4	1:5½	2,000	2,100

Another interesting device to be found at this plant is the electric-signal communication between the shipping clerk and the two plant operators. A control board fitted with three pointer-and-tap switches is located on the shipping clerk's desk. Near the scales of the mixed-in-transit plant a small box with a glass-front panel is located. This panel has a black background outlining several combinations of numerals. Small electric lamps located in the box illuminate the desired number set up on the switch board in the office. A combination of 2—1—4½ would indicate to the operator, 2 cu. yd. of 1:4½ proportion concrete.

This plant is the original one, built three years ago. It consists of a Chain Belt Co. sand-gravel hopper, of 75-cu. yd. storage capacity, mounted on steel fabricated columns, well braced by angle-iron construction. On the platform directly below the hopper are mounted the sand-gravel batcher, the cement batcher, and water tanks. The cement hopper is suspended from the sand-gravel hopper, feeding directly to the cement batcher. It has a capacity of 25 cu. ft. The cement batcher is a Butler, equipped with a Winslow scale. Adjacent to it is the sand-gravel batcher which is equipped with a Fairbanks-Morse scale. Water is handled through two 45-gal. tanks, hand-valve operated, discharging directly into the mixer.

The mixer is a Rex, drum type, and is driven by a chain drive from a General Electric 25-hp. motor. It has a capacity of 2 cu. yd.

A fleet of trucks with open-type dump bodies is maintained to handle the delivery of the central-mixed product. The fleet comprises seven Chevrolet 1½-ton trucks, with open bodies and cabs; five Ford 1½-ton trucks with open bodies and closed cabs; and two Mack 3-ton trucks, with open bodies and open cabs.

New Canadian Aggregates Plant

(Continued from page 39)

and drives are enclosed. Pyrene and Guardene fire extinguishers as well as fire hose are located at all vital points.

A 10-hp. motor-generator set furnishes 110-volt, 15-cycle current for the Hum-mer screens. All motors except the dredge and pump motors were furnished by the Lincoln Electric Co. Industrial Controller Co. automatic starters and Square D safety switches are standard. Crouse-Hinds conduit is used exclusively. Most of the plant equipment, including the anti-friction conveyor idlers and pulleys, the scalping screen, bin gates, silent-chain drives, and the crane, was furnished by the Link-Belt Co. W. S. Tyler Ton-Cap screen cloth is used on the vibrating screens.

All shipments are made by rail over the Canadian Pacific Ry. and the Canadian National Ry., both of which have sidings to the plant. A small building near the plant houses the parts storage, a change-room for the employees, and the plant office. The main office is in another building further from the plant. Officers of the company are: Major E. M. McLean, president; N. R. Nicoll, general manager; and W. E. Radcliff, sales manager. J. E. Scott is plant superintendent, and F. W. Huebner is chief electrician.

UNIVERSITY OF MICHIGAN LIBRARIES

Aids in Handling One's Self and Others in Relation to Accident Prevention*

By HAROLD S. HULBERT, M. D., F. A. C. P.
Chicago, Illinois

PSYCHIATRY is the science of treating minds which have failed to function normally. In order to understand those afflicted, we psychiatrists were lead to work out an understanding of all human mental reaction types, sane or insane, successful or unsuccessful. One lesson we have learned is that the emotional life of an individual is of vastly more importance than the intellectual (or ideational) part of his mental life. Emotions tend to direct attention: a man while emotional about himself can not keep his attention directed toward his work.

Psychiatry also has its limitations, and when we can not cure certain types of cases we can only recommend that cases of each type be collected and segregated. There is no place in competitive American industry for the insane, the feebleminded, the epileptic, the constitutionally frail or inferiors or the sick arteriosclerotics, paralytics, seniles, or cases of arteriosclerosis, cases of Bright's disease, anemia, tuberculosis, cancer, skull fracture or brain concussion. These persons, industrially unfit, can be easily identified by general observation and certain simple tests, and they had best be pensioned off or worked in groups segregated with others like themselves. The normal man is comfortable in mind and in body, at ease with himself, adjusted to his work and his environment and to his home life, and has a work record showing longer and longer periods of employment of better and better kind of employment (for a good work record shows he is neither sick, perplexed nor fatigued and also shows he is not misplaced, inadequate nor discontented). The normal man has better self-mental-discipline of the same mental tendencies as the man who is a failure, whether he learned this discipline wittingly or unwittingly. It is of some of these things of which I want to speak today.

Accidents are of human origin, therefore of mental origin. A man whose mind is on his work is not a causative factor of accidents, provided, of course, the man has previously demonstrated his fitness and his capability in judgment and in agility in the particular job or *rôle* in which he is engaged. A man whose mind is on his own personal problems or interests can not pay adequate attention to the work at hand, and is therefore a causative agent of accidents. The mental causes of accidents are thoughtlessness and carelessness in workmen with normal minds, rather than mental diseases or lack of intelligence. Distraction of attention permits hazy thinking about the work and indifference to its risks: in other words, accidents result from mental detours. Safety thinking is thinking about the work being done, not thinking of safety.

Classification

First, to anticipate the most frequent question asked on this subject, may I not say that there is no successful or scientific system yet evolved to place men or estimate an individual's character or characteristics. Of the various tests, I think the best is the personal interview between the employment or personnel officer and the applicant, and later an interview between the manager and the man he considers promoting to foreman. The next best test is a probationary period such as has been found so successful in better organized groups, such as Annapolis. West Point, nurses' training schools, and police departments. To date and probably thereafter, common sense and experience are better than theoretical tests whose usefulness has been only partially proved by enthusiasts.

The inequalities of human nature can be grappled in what is known as the human graph. This applies equally to all humans, regardless of the standard by which they are measured, be it height, age, wealth or poverty, promptness or tardiness, success or failure. Three per cent will be practically parallel to the base line, 12 per cent slightly rising, 15 per cent sharply rising, 40 per cent top plateau, which may be somewhat domed, 15 per cent sharply falling, 12 per cent gradually falling, and 3 per cent practically parallel with the base line.

The middle 70 per cent, consisting of the sharply rising 15 per cent, the plateau of 40 per cent, and the sharply falling 15 per cent, are what we call normal. Observation of a man over a reasonable period of time will enable you to place him pretty well in this graph.

Day Dreaming

This type of thinking is known by various names: phantasy with a ph, revery, day dreaming, or more properly wistful thinking or wishful thinking. It has been estimated that 11/12 of the thought-processes of the average person, excluding the old, are of this character.

These thoughts may be momentarily short or they may be minutes long. They are usually vague, pleasing, and highly emotional. They are usually ambitious and are often mistaken for the foundations of plans. They are regarded as harmless and the cheapest of indoor sports. But we psychiatrists now know that these phantasies are extremely bad

* A paper presented at the Cement and Quarry Section, National Safety Congress, Pittsburgh, Pa., Oct. 1, 1930.

for the individual in that they rob him of his initiative to make sound plans and the mental energy to carry out his plans. These wistful thoughts leave the individual apathetic and rob him of his interest in his work. If indulged in extravagantly, they lead to dementia praecox. As ordinarily indulged in, they lead to indifference, and carelessness in the daily work.

This may be illustrated by a dull punch-press operator to whom Dr. Plant once remarked, "Why, you have ten fingers and you have been on a punch press six months!" To this she replied, "It's only them what thinks that loses their fingers." The operator was right, only she did not realize that she meant the phantasy type of thinking.

These phantasies can be identified and handled as follows: a phantasy usually begins with one of three phrases, "I wish," "When," or "If." Whenever a phantasy enters the mind of an individual, he should do one of two things: he should either do something motor about it now, that is, use his hands to change the phantasy into a somewhat started or completed plan, or he should dismiss the thought from his mind and preserve his mental integrity and his interest in ordinary affairs.

There is a second form of phantasy which has most of the characteristics of the previous type, except that the mood is a depressed or anxious one and that the time is the present or the immediate future. This is called worry. The mind is filled with highly emotional thoughts, the ideas of which are incompatible with each other. The advice is the same: do something about it. The worker whose mind turns to worried thoughts about his wife in the hospital and the ability of his daughter to get her own breakfast, should be permitted to phone his home before school hours and to call the hospital several times during the day, otherwise his abstraction will take his mind from his work and lead to carelessness.

Persons who worry are those who formerly indulged in anticipatory reveries to a great extent. Usually they are not in the best of health and are not living normally. Nowadays, some of the most common causes of worry are birth control or indulging in sex starvation or sex experimentation.

The third form of phantasy is the retrospective reverie. It begins with, "Oh! If the past had only been different!" This leads to an incurable paranoid insanity, because when such thoughts enter the mind nothing motor can be done to alter the past. It is imperative that such thoughts be dismissed from the mind. People need instruction in rational forgivefulness and also in rational self-forgivefulness, the peril of which is indulgence.

The open, frank, non-seclusive, but reactive type of individual is the wholesome one. Ambitions should be limited to what is practical in attainment. A man should be encouraged to prepare himself for the next higher job above him. The advice, "Hitch your wagon to a star," or "Be ye therefore perfect," is so impractical that it is hurtful to personality. Ambitions which are more generalized should displace them, for example, "Be faithful and planful," or "Never get tired of doing your best."

Anger

The most common form of anger is from the thwarting of some impulse. The primitive form of this kind of anger is personalized. The person thwarted wants to destroy whoever put the obstacle in his path. Primitive anger shows itself best in a quick resentment, and at its worst in thoughts of revenge. The civilized form of anger is depersonalized anger; that is, a strong determination to overcome obstacles.

There is a most pernicious form of anger which should be avoided, and that is self-anger, or self-reproach, because it is inevitably baffled anger. Anger without an outlet is sickening; it is harmful to physical and mental health and to one's work. Conflict is normal in healthy males, but contemplations on conflict lead to abnormality. Socialized conflicts, within rules, such as quoits, baseball, or even pinochle, are vastly better than angry broodings. The angry workman, emotionally interested outside of his work, is little interested in his handiwork, and is an easy prey to absentmindedness. The determined man while at work substitutes his work for his problem, is energetic and helpful, and is not apt to cause accidents which would reflect on him.

The reaction of exasperation is often a cause of accidents. A man will tug at a piece of machinery to get it in place, using what he believes to be the right amount of strength. Then, being exasperated, he may yank it or hammer it ruthlessly and cause something to break or slip and thus precipitate an accident. Men should be taught that it is results, not efforts, that count, and that the group cannot proceed until each man's work is well done.

A persistently impetuous man cannot be deliberate or discipline himself, and the company will do well to let him go. The impetuous man makes mistakes not from fascination, but because of alcoholic inheritance or because he is hungry for something. Impetuous men are unreliable workers. They are almost as unreliable as stammerers, who have psychic ataxia as well as jerkiness in speech.

There is another form of anger which is an increase of irritability without any apparent increase of provocation. When a man is more irritable than usual for a day or so, it is safe to assume that he is in pain. The pain is more often physical than mental. It may be a symptom of some developing disease, a dental cavity, or eye strain. A man may be ill at ease because his wife is pregnant. In any case, a temporary increase of irritability is sufficient cause for a supervisor to send the man to the company doctor.

Criticism

It is important in the training and handling of men, and equally important at home in the training of children, to differentiate between an offense and an offender. One may disapprove or hate a characteristic in a person, but one should not therefore hate the individual.

Never totally criticize a person. Never let your foreman say, "Oscar, you damn big Swede, why in hell did you do that?" You should train your foreman to say, "Why, Oscar, I am surprised that any

UNIVERSITY OF MICHIGAN LIBRARIES

man who is always here on time and never seen drunk on a Monday morning would make a mistake like that. What the hell?"

If the foreman handles him in the first way, totally criticizing him, the man will develop a grudge against the work, against the company and against himself. He will brood over his wrongs with the constant tendency to be abstracted and in peril of causing an accident. If the foreman handles him with the better technique, the man will tell his wife that the company has noticed that he is never drunk and that he is always on time, but will not mention the mistake. He will be more alert at work to avoid mistakes and deserve favorable comment. The ratio of two slaps on the back to one kick in the pants is a good one.

A workman should not be criticized to his equals lest the speaker be quoted and his criticism reach the workers in garbled form. It is permissible to criticize the worker to his face, and of course, to report on him to his superiors. Even in such cases, however, the offense should be distinguished from the offender, and his good characteristics as well as his faults reported.

The word "shame" should never be applied for a physical condition to any person, especially to a child or young workman. To tell a workman that he should be ashamed of himself because he did not wash his hands before eating in the lunch-room of a lead factory tends to make him slovenly and hurts his self-respect.

Forgiveness

When a man has been fired, docked, laid off, criticized or otherwise punished, he should be given a receipt in full and placed in good standing when he is forgiven and returned to work. His next effort must be made a successful one, and it is the duty of the foreman and those of still higher rank to assist him and to arrange that the return to full duty is accompanied with approval and is successfully fulfilled.

The same is true with men who have been laid off because of injury. These men have suffered more or less shock, hence when they first return to light duty and when they are returned later to full duty, the authorities must see to it that the duty is successfully performed and that the man is told that they approve of his efforts and successes.

Happiness

Happiness may be regarded as the opposite of anger. Happiness is the emotional state which accompanies the carrying out of ideas and plans if these plans were, in part at least, of the individual's own making, whereas anger is the emotional state which results when the carrying out of one's plans is baffled. Practically every sentence in this article is based on the tragic life history of one or many individuals. It was my duty during the war to become acquainted with the hospital care of sick and wounded British soldiers. These men were called "Blue Boys" because the hospital uniform was entirely blue. At the hospital where these experiments were made, the Blue Boys had been thoroughly institutionalized by being there many months. They had been thoroughly studied and records had been kept of their reactions.

One incident will show the effect of happiness on physical effort. A certain group was assigned to certain medical officers. One doctor was on the first floor and another on the second floor. All day long this group of soldiers sat in the office downstairs and at intervals one would come to the doctor's desk to have his pulse and blood pressure recorded. He would then walk up the long flight of stairs for a similar test. These soldiers would repeat the test at half-hour intervals during the day, day after day and week after week.

One Saturday morning a sergeant major came into the room where the soldiers were waiting and read a list of names. Those whose names had been read would not be permitted to have "shore leave" or leave to go down town for Saturday afternoon or evening. It was observed that the next time these disappointed soldiers walked upstairs their blood pressure was lower and their purse rate was higher.

Then about two hours later the sergeant major came into the room and announced some mistakes on his list, that it was Smyth, not Smith, and Robertson instead of Robinson who had been denied leave. On the next test the men who had regained their happiness were able to walk upstairs with as little effort, as shown by the blood pressure and pulse data, as they had on previous days. This demonstrates again the fact that avoidance of unhappiness lessens fatigue hence lessens the risk of causing an accident.

Fear

The use of fear as a whip to keep men in line and to do their work well lest they be laid off or bawled out must be used in very great moderation. Fear is a poor whip. To be sure, there are many men of low intelligence who may react well to fear, but in men of average or high intelligence fear is distracting to attention. Fear limits output. It produces an unwholesome state of physical health, and should therefore be saved for a few emergencies. A disagreeable foreman or school teacher of whom all are in fear should be transplanted.

On the other hand, tenderness or solicitude should not be overdone. Workmen do not do well if they know they are pitied; they do even less well if they develop self-pity.

Anxiety

Anxiety in the mind with concomitant physical sense of tension is caused by incompleteness, repression, or by self-conflict in the inner mental life. It shows itself in a depression of mood and also in doubts and indecisions. Persons in a state of anxiety need help. Problems which produce anxiety are usually those which can be understood or helped by physicians, social welfare workers, or priests. Anxiety, if intense or prolonged, may lead to hysteria or neurasthenia.

Anxiety sometimes develops after an accident while the claim is still unsettled. Then if the claimant is allowed to "jew up" the claim agent when a

settlement is arrived at, there will not be the tendency to have a chronic neurosis, whereas if the claim agent "jews down" the claimant, a chronic neurosis may follow and the company loses the efficiency of a former good workman and the community loses a self-supporting citizen.

The human mind craves certitude. Few of us can stand uncertainty. It will either give mental anxiety or produce a conversion hysteria. Almost always the cases which develop conversion hysteria are persons who tamper with sex living. Persons who are biologically wholesome are not predisposed to develop marked anxiety, but the anxiety can be about other things—finances, returning to work, and so on.

I hold no brief for persons who indulge in misconduct, but I do think a man is not as bad off if he indulges in an evening of carousing as he is spending many hours brooding about, "I wonder what my wife is doing," or "I wonder if I can't get next to Joe's wife while I'm on my way home from work." A highly emotional life is more destructive than the misconduct itself.

Fatigue

There is an increase in accidents from mental fatigue or emotional fatigue from being overstimulated or over-hurried too long. A short campaign is better than a long one and is followed by less reaction and is permanently followed by a more enduring improvement. Many slogans lost their stimulating ability when they became commonplace such as, "Watch your Step," or "Safety First." A slogan particularly appeals to the man or group of men who developed that slogan but to others its appeal rapidly fades.

Fatigue leads to accidents. Fatigue is increased by unhappiness and decreased by happiness. Happiness also increases accuracy. That a kind word or properly spoken request increases the workman's accuracy was observed in elevator operators who stop their cars more accurately with the floor level when the passengers say "fourteen please," than when the floor number is given in an abrupt or muffled tone. Men who are constantly unhappy should be placed at work where the accident risk is small or where accuracy is of minor importance.

Monotony of work leads to indifference to the execution of that work. This flagging of interest causes wandering of attention or even drowsiness. Accidents are prone to follow. What is here said, as is true elsewhere, is as applicable to executives driving their Packards as it is to workmen in the quarry or shop or factory.

Surprise

Surprise is defined as an emotional state, that is, a state of excitement, not a state of thinking, or at least not a state of clear, orderly thinking. The surprise lasts until the individual arrives at a definite thought as to what should be done under the circumstances. Surprise leads to complications of accidents. The prevention of surprise is to permit and encourage men to be decisive and to acquaint the individuals who might be surprised with the probable complications of such types of accident.

Rehearsals, such as life saving or training in resuscitation, are preventatives of surprise. In any type of accident, experience in similar accidents lead to less surprise in case of recurrence because the experienced person is now endowed with ability to make decisions based on previous knowledge.

Obedience means the giving of rewards for unusually good conduct or dealing out punishment for misconduct. A firm will not prosper if the superintendent is permitted to fire employees on the recommendation of the foreman, but must wait until the January meeting of the board of directors to promote a man for unusual ability. Rewards and punishment should be offered proportionately.

Discipline, by definition, means the setting of an example or the following of an example which has been set. It does not mean punishment. A disciple is a follower. In our every day life discipline is more effective than instruction. The foreman who violates the "no smoking" rule cannot by punishment get his men to observe fire hazards.

Morals

A man can not defy the moral code of his group or sub-group, while stupefying his conscience with excuses which are satisfactory to himself but which he knows would not be satisfactory to others, without showing a decline in personality and in usefulness. This deterioration of personality, from self-indulgence, is almost as severe as deterioration from drugs. Such employees should be once warned and then dismissed.

Respect and Self-Respect

Self-respect is based on two things of equal importance. The first is good or improving health, and the second is a consciousness of the individual's own liabilities and assets. A person who overemphasizes his own limitations has a so-called inferiority complex and has crippled his occupational and domestic life, whereas a person who minimizes his limitations while he magnifies his abilities is proud, but ineffective as a leader.

The normal individual is equally self-critical and self-approving, but he is careful never to confess to others his shortcomings nor to boast about his exceptional abilities. He takes himself for granted, concerns himself moderately with self-improvement, and is concerned mostly with his work. He places the emphasis on his production and minimizes the emphasis on his overhead or himself. When an individual is in good health or improving health and has a proper balance in the two phases of self-regard, then automatically and inevitably he commands the respect of others without deliberately seeking it. This probably is the most important point in the development of personality and of usefulness in the world.

A good way of establishing a man's self-respect and at the same time disciplining him is to ask him about himself. "How are you getting along?" "What progress are you making?" "What can we do to help you?" "What do you think of yourself as an employee for such and such a company?" He will tell you. Then say, "Now describe yourself as

UNIVERSITY OF MICHIGAN LIBRARIES

the foreman sees you. Describe yourself as you think the doctor sees you," and make the man see himself from several points of view. He will take himself much more seriously after that and he will try to do those things which appeal to the superintendent, the company doctor, and the foreman. You haven't hurt his self regard. You have given him something to think about, and I think that is respect building.

There is a close but complex relation between a man's physical health and his intellectual capacity and emotional life. In men of 40 to 55 a lessening of mental vigor, imperceptible at first, is found in about 1/6th of all cases examined. It usually is due to heart or kidney (Brights') or blood vessel disease; these conditions are very easily disclosed by any physician by examination of the heart, blood pressure, blood and urine. Really, you men and other executives owe it to yourself and your families and your companies to have an annual physical examination, preferably during the week of your birthday. You also owe the duty of sensible living. Drinking isn't safe, it is smart-aleck. Sweating once a week from hard work or hard exercise will add years of life to the average sedentary man.

Nervous breakdowns, so called, occur when there is at the same time a great emotional strain plus a state of poor health such as acute tonsilitis or convalescence from influenza, but they do not occur in healthy persons from emotional stress or strain nor do they occur from poor health under ordinary stress. You can not anticipate when death or other family or even financial strain may come to you, therefore it is of vast importance for men like you to maintain your own health at a high level.

Inferences

Men can make or mar themselves largely by their mental habits. An inference is a conclusion based on slight data. Almost all persons regard themselves as smart enough to make inferences. Actually but few are able. The most intelligent persons rarely make inferences but do engage themselves in getting more data, form a tentative opinion or judgment but are open-minded and welcome still new data while they are reacting to their provisional judgment.

Most men infer unfavorably to themselves and about others with the consequent paralysis or paresis of effort, or with diminishing friendship and diminishing approval for others. The bookkeeper receives a telephone call saying that the boss wants to see him in the office at ten o'clock. He spends the intervening time inferring unfavorably to himself about such trifles as "Did the boss see me at the White Sox ball park on the afternoon I stayed home pleading sickness?"—"Did the boss know that I had joined the bookkeepers' racket?"—"Did the boss notice that I parked my car near a fire plug in the yard?", et cetera ad nauseam. He might know the boss would not have sent for him unless the boss wanted something.

All conversations begin with "I want" on the part of the person inaugurating the conversation. The presumption is that the boss wanted the bookkeeper to help the boss do something the boss wanted. The bookkeeper should have inferred that he might give the boss anything from his department that the boss wanted. He would be a better bookkeeper and would soon be promoted. When one infers favorably, one risks 11 per cent error only: if one infers unfavorably, one tends to create unfavorable circumstances.

The habit of indulging in comparisons is very common and is very dangerous. When an individual compares himself with any other specific person or when an individual is compared by an outsider to any specific persons, an unwholesome state of mind follows which shows itself in less accurate productive work.

Persons, usually between the ages of 31 to 38, sometimes show an overdevelopment of this bad habit and we call them paranoid. Such employees are stormy petrels. They compare conditions here with conditions in Russia or in the good old days or under the former boss; they preach the philosophy that "we workers own our jobs." They are too talkative and argumentative and should be discharged for they are as bad as a rotten apple in a barrel of good ones.

Character

Character is the sum of the decisions an individual has made during his lifetime. A person of strong character is a decisive person. A person of weak character is one who cannot make and adhere to his own decisions. Others make his decisions for him or he is vacillating in adhering to his own decisions. Usually a person of strong character is also of good moral character — for example, Roosevelt, Wilson, Gary. There are some exceptions, such as leaders in our politically protected crime gangs. These leaders are decisive men of strong character, but according to our code they are not of good moral character. Character can be developed in a person just as deliberately as ability in music or boxing.

Business character can be developed in young workmen. When a new employee comes to work at a factory or office, he should be allowed some latitude in deciding how he will fulfill his duties. A clever foreman will tell him that he can turn an object on the lathe either from left to right or from right to left. A clever head clerk will tell the new office boy that he has to deliver three envelopes to three places in whatever sequence he decides to follow. For when an individual feels that he may make some decisions about his work he has started to develop a business character, and other things being equal, he will be of relatively greater value to his company in future years.

The strong character who has ability to make his own decisions must, of course, be differentiated from the opinionated person who complicates the lives of others by firmly expressing the first opinion that enters his mind without weighing the pros and cons of a situation. A man accustomed to making prompt decisions is more attentive, is less predisposed to cause accidents, is better equipped to deal with an accident which has been caused, and recovers more quickly from surprise after an accident.

Single Diesel Engine Supplies Power to Operate All Plant Machinery

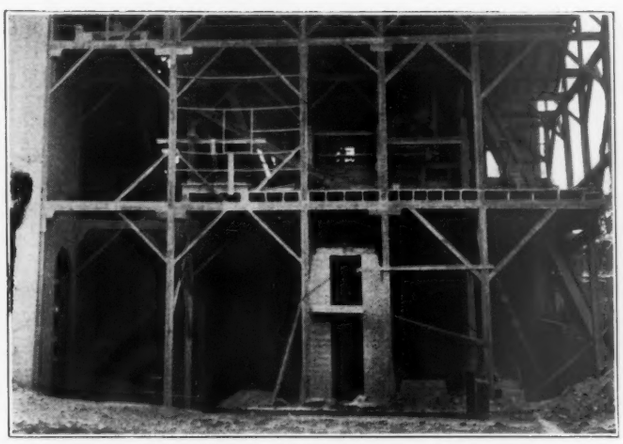
Clutches Are Thrown in Automatically When Main Drive Shaft Starts to Turn

THE state of Kentucky, not to be outdone by its neighboring states, has engaged in an extensive program of road construction, particularly in the interior sections. The program calls for considerable tarred, crushed-stone surfacing, creating a demand for large quantities of this material. It is for this reason that the Sunbeam Quarries Co., in the fall of 1929, developed a new quarry and erected a new crushing mill near Clermont, Kentucky.

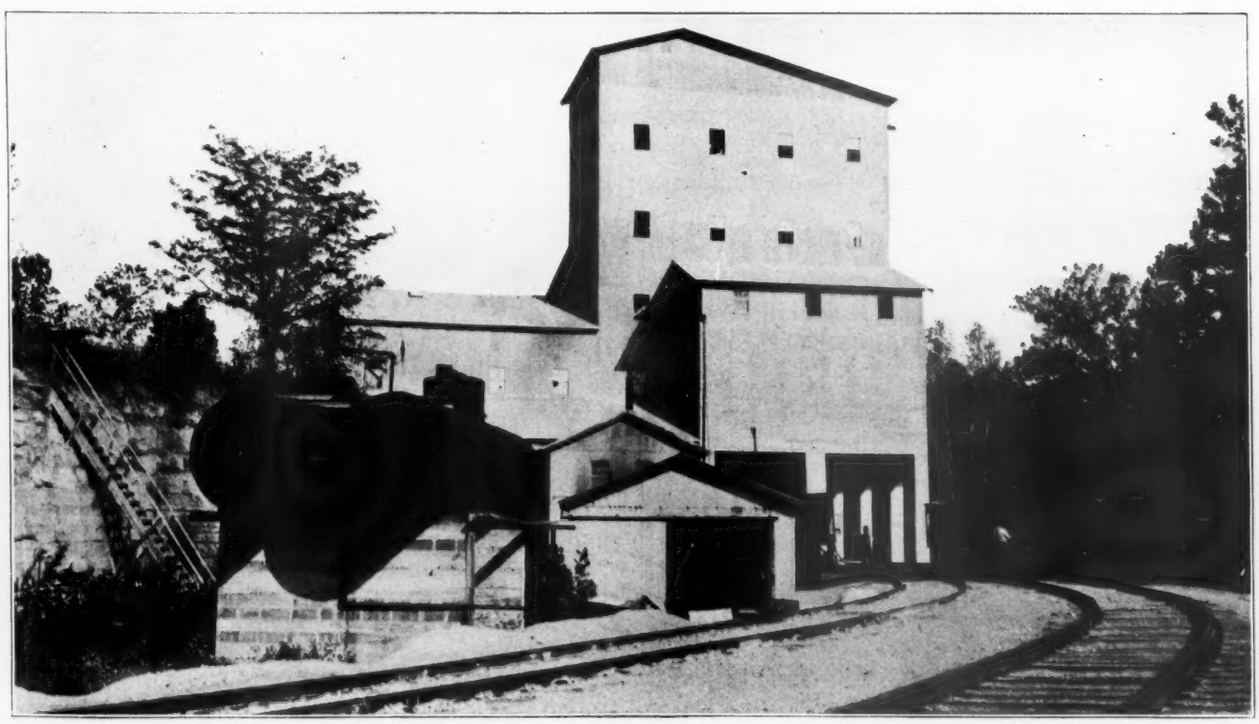
Clermont is a small community located about 28 miles south of Louisville, in the heart of the once famous whiskey-distilling district. The plant and quarry are located near the Louisville & Nashville R. R. which affords shipping facilities.

An inspection of the crushing mill will reveal that it is a modern plant, strictly up-to-date in every detail, and adhering rigidly to the proved methods of handling materials without any attempt at experimentation with new and untried equipment.

A noticeable feature of the crushing mill is its source of power. Not being near to electric-power transmission lines, it was necessary to install an independent source of power, utilizing either steam, gasoline or oil. A Fairbanks-Morse full-Diesel type engine has been erected in a complete engine room. This unit has a rated horsepower of 560, and supplies all the power used in the plant by means of an extensive line-shaft system. Each main line-shaft is equipped with a Cutler-Hammer magnetic clutch, automatic in operation, releasing the engine from the load until operating speed is reached. Power for the clutches is supplied by a 25-kw. generator belted from the engine drive shaft. Thus, when the engine is operating at a low speed or is stopped entirely, the generator fails to supply sufficient



Scalping screen and secondary crusher in crushing building.



Plant as viewed from west, oil-storage tanks in foreground.

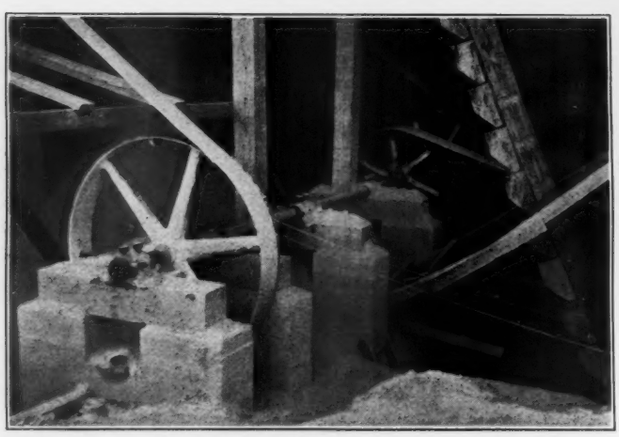
UNIVERSITY OF MICHIGAN LIBRARIES

Overburden and waste rock are hauled in a crawler trailer by a tractor locomotive.

power for the clutches which then release the line load. Controls for the clutch are so arranged that either the line-shaft or the Sullivan air compressor may be operated independently, or they may be operated together as required. Push-button remote controls are placed at convenient points around the plant. The generator also furnishes power to the two centrifugal pumps for oil and water circulation. Compressed air from two "bottles" is used to start the engine. Each bottle is a 30-in. welded steel tank 8 ft. long, and is supplied with air from a small gas-engine-driven air compressor.

Outside the engine house is the pond for cooling the circulating water. This pond has reinforced concrete walls, is 30 ft. by 30 ft. and 5 ft. 6 in. deep, and has a capacity of 28,000 gal. of water. A Fairbanks-Morse 3-in. by 4-in. centrifugal pump driven by a 7½-hp. motor, receives water from the cooling pond on its suction side, pumps it through the water jackets of the engine and returns it to eight spray nozzles above the pond. The nozzles break up the water into a fine mist permitting it to cool in contact with the air.

Crushing mill, quarry at right.

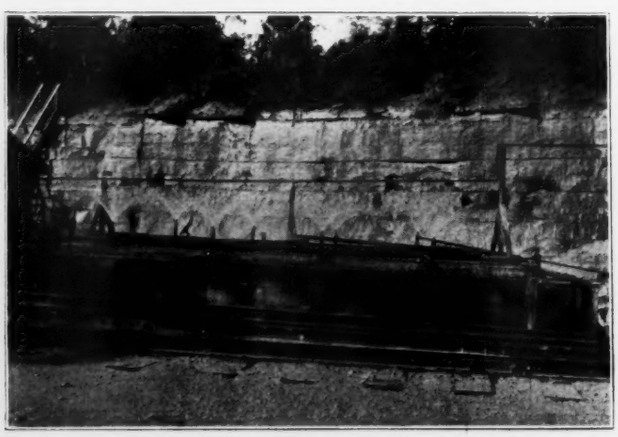


This line-shaft drives three crushers, two elevators and two classifying screens.

Gasoline-electric shovel loading rock into quarry car.

The Diesel engine burns a low grade of distillate oil. Two tanks having a total capacity of 12,000 gal. are used for storage. Oil is fed by gravity to a small supply tank near the engine. The entire equipment for the Diesel engine installation was furnished by the Fairbanks-Morse Co.

Water for the cooling pond and for the plant use is supplied from a lake located some distance from the plant. This lake is artificial, having been made by damming a spring-fed stream. The lake covers an area of 7 acres and is the private property of a prominent Louisville automobile dealer who has built a beautiful summer home on its shores. It is said to be well stocked with game fish. Water for the plant is supplied by a siphon pipe.

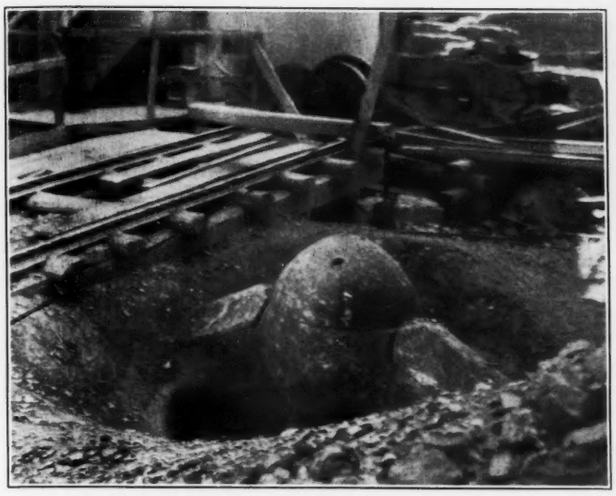


Cooling pond and spray nozzles.

The Sunbeam company owns 35 acres of land for the development of its quarry. A 2,600-ft. face has been opened and worked, and extensive overburden removal has been carried on for some time. The overburden in this case consists chiefly of a low-

grade rock, soft and of a sandy nature. It is drilled and blasted, then loaded into a Wood tractor truck body equipped with a Wood hydraulic hoist for unloading. A Caterpillar 60 tractor draws the loaded trailer to a large waste dump to the east of the quarry. A Marion ¾-cu. yd. excavator is used for loading the overburden into the truck body.

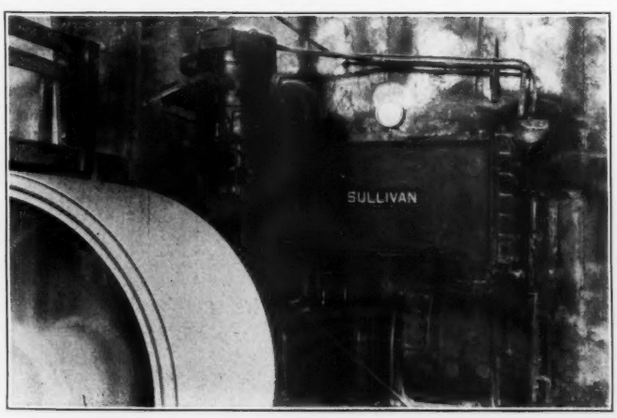
Blast-holes are sunk by an Ingersoll-Rand wagon



Primary-crusher spider and the track approach.

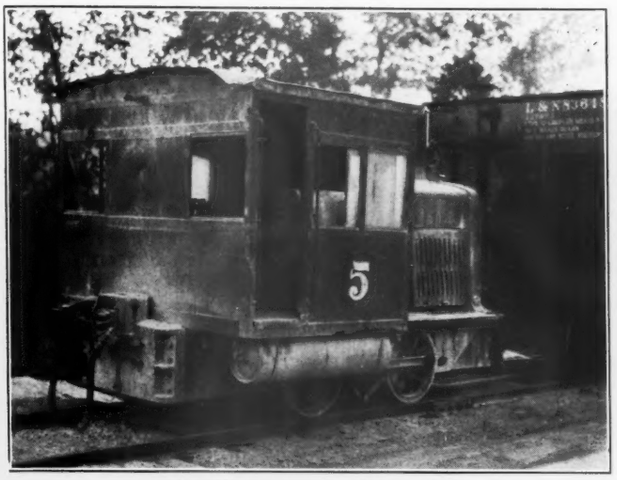
rig equipped with an X-71 air drill. Holes 2½-in. in diameter are drilled to a depth of 30 ft. About thirty holes set in double rows, approximately 7 ft. on centers and 7 ft. apart, are shot at one time. Various types of powder have been used including Hercules, Trojan, Atlas, Du Pont and others, no definite make having been standardized. Air for the Ingersoll-Rand drill-rig and for the Jackhamers used on the overburden ledge is furnished by a Sullivan two-cylinder angle compressor, 17-in. by 10¼-in. by 12-in., direct-driven from the main shaft of the Diesel engine, separated by the electric friction clutch.

A Marion gas-electric, 1¼-cu. yd. excavator loads



Air compressor driven from Diesel-engine shaft, the main pulley for the mill drive in foreground.

the blasted rock into a Western Wheeled Scraper Co. railroad type, side-dump car having a capacity of 8 cu. yd. of material. Eight of these cars are used about the quarry, they having been used for handling overburden and fill when the quarry was first opened. At present the haul from the quarry to



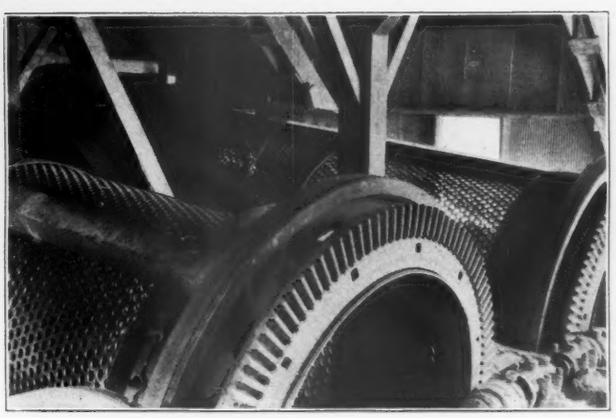
Six-cylinder gasoline locomotive.

Water is siphoned from this artificial lake to the plant.

the crusher spider is but 450 ft., and therefore the one car is moved by a wire rope drawn from a winch which is driven from the plant line-shaft. When the car has been unloaded, it returns by gravity to the shovel. As the track is lengthened, trains of cars will be handled by a small inter-plant locomotive. Standard-gauge tracks are used.

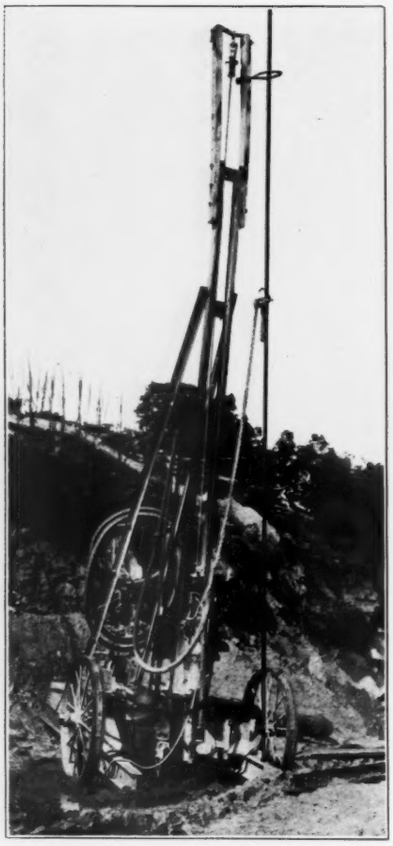
The plant is located slightly above the floor level of the quarry, therefore requiring no incline, as the cut into the quarry becomes greater. An unlimited supply of stone is available before further cuts into the floor become necessary.

The crushing mill was designed by the Allis-



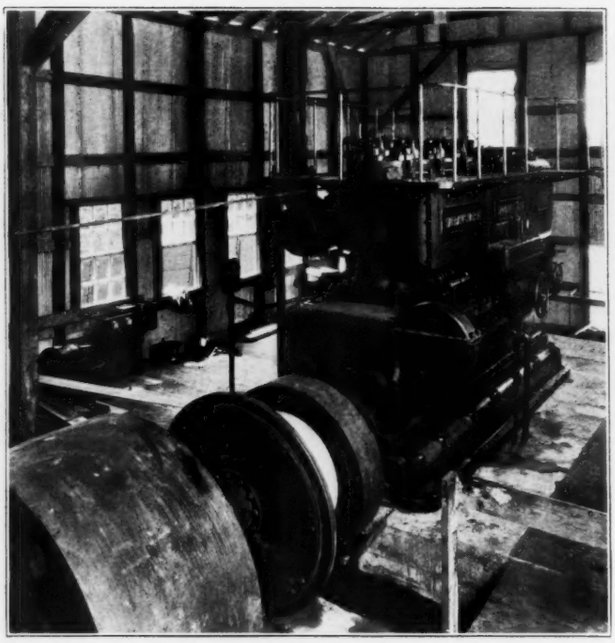
Two revolving classifying screens.

UNIVERSITY OF MICHIGAN LIBRARIES



Drill rig using 30-ft. steels.

Chalmers Mfg. Co., of Milwaukee, Wis., and practically all of the mill equipment used was furnished by this company. Three crushers are employed to reduce the rock to the desired sizes of crushed stone. The first is an Allis-Chalmers No. 30 McCully gyratory, and is placed below ground-level on massive concrete foundations. The spider is located at ground-level directly alongside the plant, to receive the blasted rock from the quarry. This crusher prepares a 4-in. material which is carried to the plant scalping screen by an Allis-Chalmers 30-in. belt elevator equipped with steel buckets. This elevator has 60-ft. centers. The scalping screen is 4 ft. by 8 ft. in size and is equipped with a series of rolls permitting ready flow of oversize rock and allowing the material below 2-in. to fall through to the main belt elevator which carries it to the classifying screens. Rejected rock from the scalper does not return to the primary crusher, but to a Allis-Chalmers No. 10 crusher which crushes the oversize to 2-in. rock and passes it to the classifying screen elevator. The use of this crusher prevents the primary breaker from being glutted with small-size rock, and allows it to handle its full capacity for primary breakage. The elevator referred to—which transports the material to the classifying screens—is 90 ft. long on centers and has a 30-in. belt with steel buckets.

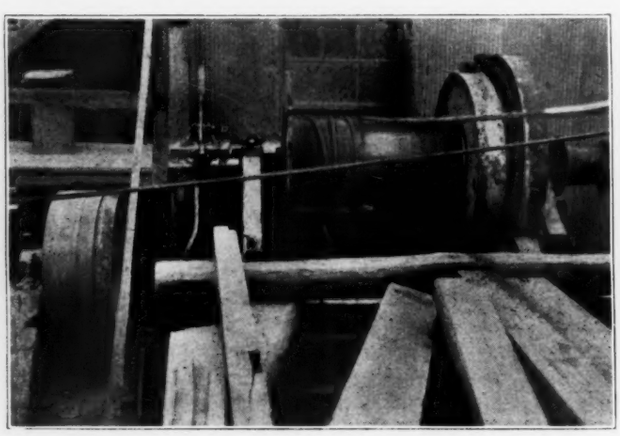


Diesel engine of 560-hp. capacity, with magnetic clutch and 25-kw. generator.

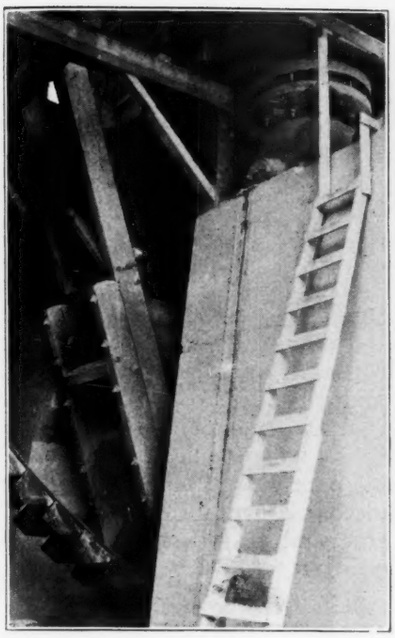
Two classifying screens, both Allis-Chalmers, are used to size the crushed stone. They are 6 ft. in diameter and are 18 ft. long. The inner screens are made of steel plate, consisting of two sections, one having 12 ft. of 1¼-in., and the other 6 ft. of 1½-in. perforations. Each screen has a jacket consisting of two 5-ft. sections, one section being of steel plate with ¾-in. perforations, and the other a ⅞-in. wire-mesh cloth. Oversize stone from these screens is returned to the third Allis-Chalmers crusher, which is set at 1¼-in. The crushed stone from this unit is returned to the classifying screens by means of the bucket elevator.

Two sets of vibrating screens are employed to

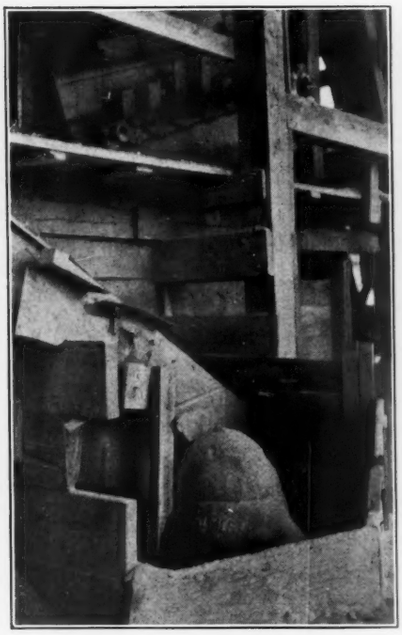
Second bank of vibrating screens for agricultural limestone.



Winch by which cars are moved from quarry to plant.



Secondary crusher and elevator to classifying screens.



Secondary crusher below the scalping screen.

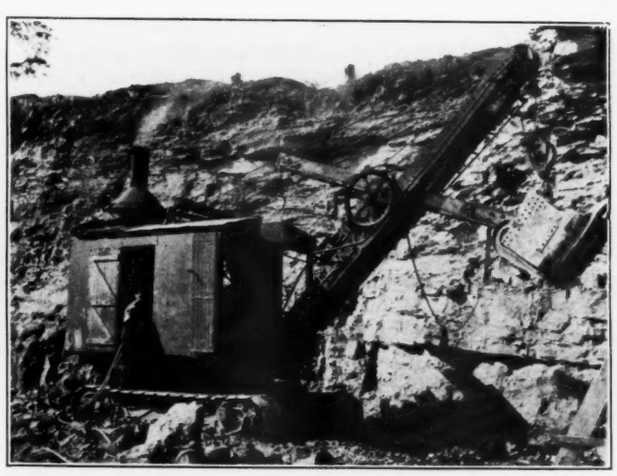
Where freight cars are loaded. Note walkway at left.

obtain and classify the crushed fines for agricultural limestone. All materials from the classifying screens, from 7/8-in. down, pass over two Universal 3-ft. by 8-ft. vibrating screens having 1/4-in. mesh. The oversize falls into a storage bin beneath, while the material passing through the mesh flows to the second bank of vibrating screens. This bank comprises two Universals, 3-ft. by 8-ft., with 1/16-in. mesh screen. The fine dust passing through these screens flows to a bin beneath to be shipped. The material from 1/4-in. to 1/16-in. also flows into storage bins and is sold in this grade. A pulverizer is used, however, to reduce this material to finer grades, should these be desired. The pulverizer is an Allis-Chalmers unit having a 200-ton daily capacity.

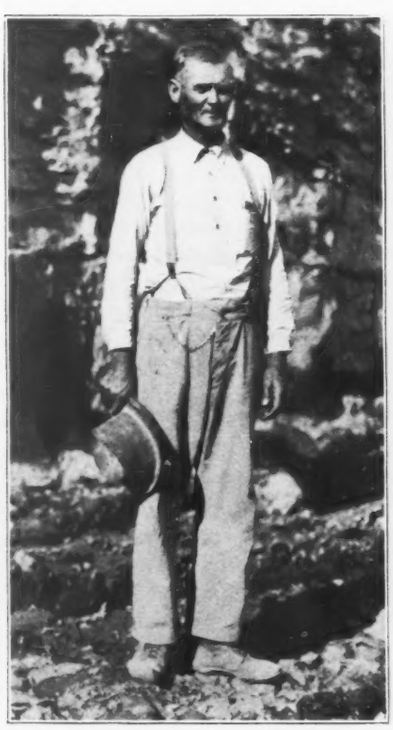
Beneath the classifying and vibrating screens are located the storage bins. The total capacity is 30 carloads. Three grades of stone are commonly stocked, with two grades of agricultural limestone. The bins are supported on heavy concrete piers, permitting two side-tracks to pass beneath the bins for loading.

Three side-tracks, with access to the plant and the quarry, have a total length of about two-thirds of a mile. They are operated from the Louisville & Nashville R. R., Springfield division. Cars are moved on the company tracks for loading by a Whitcomb 6-cylinder gasoline locomotive.

The Sunbeam company began operations on the site in November, 1928, and the crushing mill was placed in operation in September, 1929. The plant capacity was designed for 1,500 tons per day, and it is operated under the supervision of J. M. McAfee, who has had many years' experience in the crushed-stone industry. J. B. Beam is president, L. E. Marks is vice-president, and T. J. Beam is secretary-treasurer and general manager.



Stripping is done by this steam shovel.



J. M. McAfee, general superintendent.

UNIVERSITY OF MICHIGAN LIBRARIES

What 56 Cities Think of Central-Mixed Concrete for Street Paving

Returns from Questionnaire Indicate Engineers Look with Favor on Method

SEEKING to learn the results of using central-mixed concrete in street construction, the American Road Builders' Assn. has just completed an extensive survey of municipal engineering departments covering 56 representative American cities. Questions were prepared at a meeting of the Committee on Central- and Transit-Mixed Concrete of the Association which met at Washington, D. C., on October 6 under the leadership of P. F. Seward, assistant engineer of the association. Those attending included Robert Harris, Blaw-Knox Co.; S. Poliakow, sales manager, Biehl Iron Works, Inc.; A. P. Robinson, Ransome Concrete Machinery Co.; V. R. Burton, deputy state highway commissioner, Lansing, Mich.; C. S. Miller, chief engineer, Virginia state highway department; C. E. Meyers, director of transit, Philadelphia; H. K. Talbot, National Equipment Corp., Milwaukee, Wis.; H. L. Clemmer, engineer of tests, District of Columbia; P. C. McEwen, state highway engineer, Tennessee; D. L. Levi, engineer of construction, Missouri highway department; Alex Foster, Warner Co., Philadelphia; Harry Bachman, Yaeger Machine Co.; B. F. Devine, Chain-Belt Co.; T. A. Gillespie, T. A. Gillespie Co., New York; M. J. Williams, Euclid Crane & Hoist Co.; and R. K. Compton, director of public works, Richmond, Va.

A digest of the results of the data obtained indicates that this modern method of making concrete is, on the whole, quite satisfactory and is permitted by 75 per cent of the cities questioned. Several, however, reported no experience with the premixed material.

A surprising fact brought to light by the returns is that the general practice is not to agitate the concrete enroute to the job, only eight cities conforming to approved methods of keeping the concrete in motion while transporting it.

The average maximum time allowed between mixing and placing the concrete is between 35 and 40 minutes, the figures indicate. Birmingham, Ala., and Topeka, Kan., show the widest latitude in this respect, allowing as much as 60 minutes to lapse before the concrete goes into the forms. Boise, Ida., and Cheyenne, Wyo., are the strictest cities in this regard, their specifications permitting but 10 minutes as the maximum allowable time between mixing and placing.

That the slump test for determining proper consistency is being rigidly adhered to is indicated by the fact that only five of the 56 cities reported that the method was not required by specification. There appears to be a wide variation in the maximum slump allowed, however. For base-course work, the average slump figures 2.85 in., while, for standard one-course design, the average maximum slump is 2.60 in. Topeka, Kan., specifications permit the greatest slump—4.5 in. for both base-courses and one-course pavements. This high water content, no doubt, accounts for the fact that Topeka allows a full hour's time between mixing and placing the concrete, although this is not in accord with the general practice, which is to use a drier mix with resulting higher early and ultimate strengths.

Oak Park, Ill., largest suburb in the Chicago area, specifies the least slump, allowing but a 1-in. drop of the concrete as deposited from the slump cone. Another city, Houston, Tex., specifies a 1-in. maximum slump for one-course work but permits 3 in. for the base-course when brick, asphalt, or other type of wearing course is to be laid.

At Duluth, Minn., change of specifications to permit the use of ready-mixed concrete in paving work is now under consideration, according to the survey. Flint, Mich., reports that the erection of a municipal plant is contemplated in the near future to care for all city work, officials believing that better concrete at lower cost may be produced by this method.

Greensboro, N. C., engineers have found by experience that segregation has occurred on long hauls unless some agitating method was employed.

Hartford, Conn., urges a better method of transferring concrete from the carrier to the grade. Its engineers believe the common practice of employing a chute is objectionable because of the pulling apart of the concrete. At Richmond, Va., too, some other means of depositing the concrete than by the use of chutes is suggested.

Hastings, Neb., one of the municipalities which, at present, frowns upon the use of central-mixed concrete, gives as its reason the belief that "the slump and water content can best be controlled where the product is mixed on the job." The only objection voiced by Jacksonville, Fla., paving engineers is that the water content is sometimes difficult to control, although it permits central-mixed concrete to be used. Portland, Ore., authorities report splendid results obtained by the central-mixed method.

Finding that control of the water content is, at times, rather difficult, the engineering department of the city of Seattle, one of the cities having a large proportion of concrete-paved streets, is developing a "consistency meter" for use at the mixer, and improved transporting equipment.

From St. Louis comes the suggestion that im-

provements are needed in the form of trucks used, and the recommendation that storage bins be employed to reduce segregation of aggregates.

After one year's experience with central-mixed concrete, engineers at Wilmington, Del., have found that "concrete from agitator trucks is very satisfactory—dump trucks have a decided tendency to induce segregation."

State highway departments were also questioned with results along the same lines as the municipal survey although they were not as complete, many states reporting no experience with pre-mixed concrete in highway work.

The general attitude seems to indicate that central-mixed concrete has come to stay. It is through such fact-finding surveys as this that the little resistance that does exist will be ultimately broken down through the development of new and improved equipment. Much of the credit for the advance and success of this comparatively new industry is due to the manufacturers of machinery designed to improve the quality and facilitate delivery of the material.

Plant's Liability for Spread of Dust

(*Continued from page 26*)

emitted "a very black, dense smoke, which smoke is a nuisance." Testimony was introduced proving that the smoke entered the windows of the building, blackening the walls and inconveniencing and discomforting the occupants of the building.

The owner of the plant admitted that he had previously used coke, but stated that recently he had been unable to obtain coke except at prohibitive prices, and that no more smoke was emitted from his boiler than was absolutely necessary in the proper operation of his plant.

Also, the owner of the plant contended that the owner of the Holman Building was not entitled to relief because his plant had been in operation several years before Holman erected his building in close proximity thereto.

Notwithstanding this argument, although the lower court held the owner of the plant not bound to use coke instead of soft coal, the higher court reversed the verdict, saying:

"Neither the opposite party nor the public has the right, legal or equitable, to invade the clear legal rights of another . . . . The case in hand is purely one for injunctive relief against a nuisance in consequence. Equity is asked to do no more than to restrain the defendant (owner of plant) from using soft coal, that is, 'such coal as throws out a black, dense smoke,' and the evidence in the record is such as to authorize a finding by the jury that the use of coke was at once convenient and practical."

Also, in Catlin v. Patterson, 10 N. Y. S. R. 724, the court enjoined a plant from burning shavings and sawdust, since it was shown that the fuel so used in the furnaces gave forth great volumes of smoke which was carried into the homes and buildings on adjacent property.

Temporary Nuisance

On the other hand, temporary use of soft coal does not always give the legal right to owners of adjoining property to complain or obtain an injunction against the owner of an industrial plant, nor is it necessary for the owner to close down the plant where he is temporarily unable to obtain coal which does not emit smoke, although a court has previously granted an injunction against use of soft coal. In other words, an injunction against use of soft coal actually has the legal effect of permitting the owner of an industrial plant to use soft coal temporarily when he cannot obtain other fuel.

For example, in Nelson v. Milligan, 151 Ill. 462, the injury sought to be enjoined was the permitting of dense smoke and soot to be emitted from a smoke stack, which was cast into the doors and windows of an adjoining dwelling house. It appeared from much conflicting evidence that the nuisance complained of was not continuous in its nature, nor was the injury such as could not be fully compensated for by money damages. Therefore, the court held that the nuisance complained of was not the proper subject for injunctive relief and said:

"The decree in effect finds that, while using 'West Virginia coal,' no appreciable dense smoke was emitted, and there is no conflict in the evidence as to the fact that defendants proposed using that quality of fuel, and had done so when it could be obtained. While it is true that the consequences of their not being able to get, or unwillingness to use, the better and higher priced quality of coal, cannot be visited upon complainant without compensation in damages, it by no means follows that a court of equity will make them liable to its penalties for contempt, if they should be compelled to use the inferior fuel temporarily to avoid abandoning their business."

Nuisance May Be Enjoined

For reasons of herein previously explained higher court decisions, neither a city, private individual, nor firm may maintain a legal nuisance, particularly if such nuisance is detrimental to the health of the citizens and can be eliminated. This is true although the same has been in existence for many years previously. In other words, the right to maintain a nuisance cannot be secured by the fact that no person has complained or filed suit during the past several years.

The latest case involving this point of the law is Gundy v. Village of Merrill, 230 N. W. 163. Here it was disclosed that several property owners filed suit to enjoin a corporation from conducting its business in such a manner that undesirable and unhealthful gases, vapors, and odors arose and settled on surrounding property to such an extent that the residents were compelled to keep their doors and windows closed.

It was contended that since the present conditions have prevailed for fifteen years, the property ownwithstanding this argument, the higher court diers had therefore lost their right to complain. Notrected the corporation to eliminate the nuisance.

UNIVERSITY OF MICHIGAN LIBRARIES

General view from top of hill. Primary crusher, left; center and half-way down hill, secondary crushing plant and bins; right, in distance, central-mixed concrete plant.

Crushed-Stone Plant Builds Profits by Producing Pre-Mixed Concrete

New Jersey Quarrymen See Increased Market and Erect Complete Unit to Serve Builders

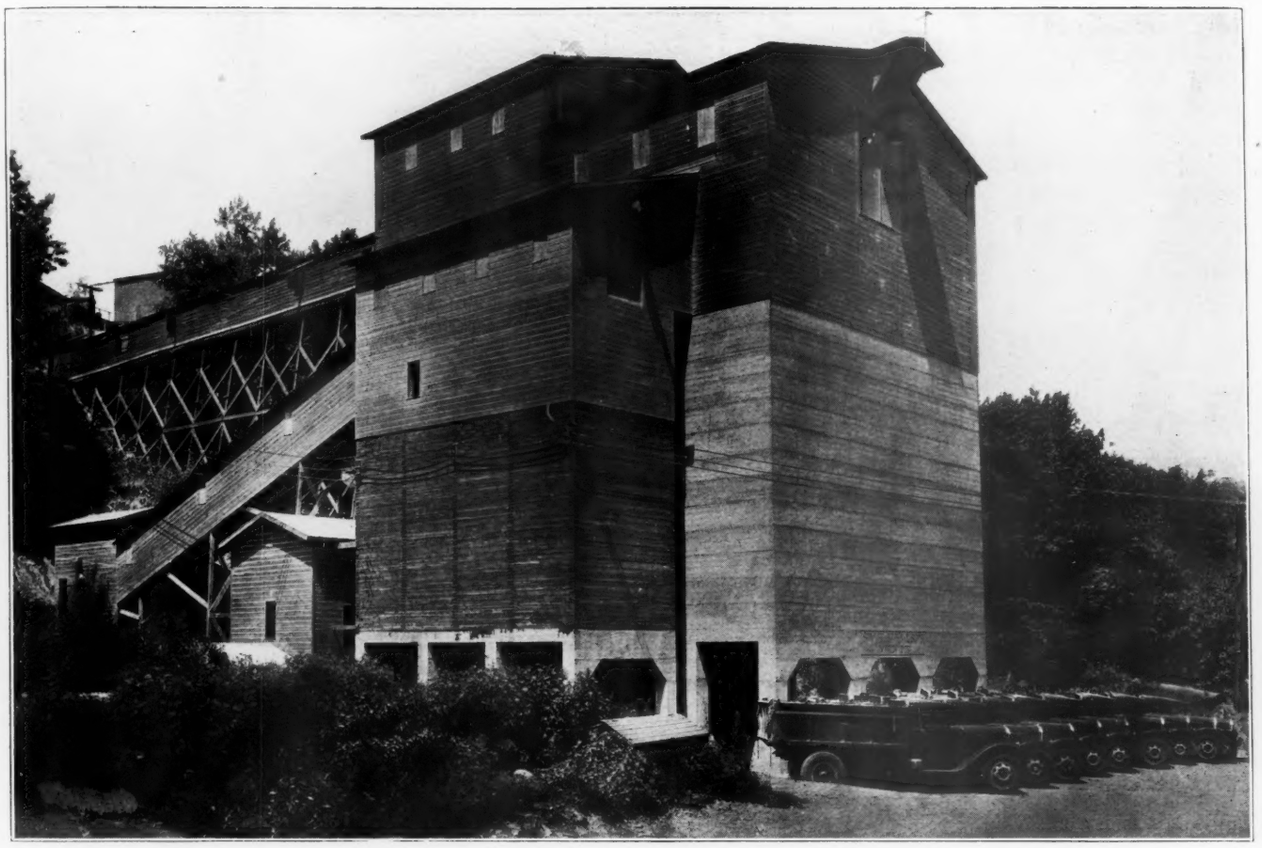
A NOTABLE example of a stone quarry that is keeping abreast of the times may be seen in the plant of Samuel Braen's Sons on the mountainside at Hawthorne, near Paterson, N. J. The business was started in a small way some 25 years ago and has grown and developed until, now, the firm's equipment is modern and adequate in every way.

Until this year the plant was run solely for producing and selling commercial sizes of crushed stone but, early last spring, the owners saw the growing market for ready-mixed concrete and laid out and erected a well-equipped central-mixing plant.

The quarry itself is typical of its kind in the trap-rock section of northern New Jersey with a vertical working face about 75 ft. high by about 600 ft. long. The rock broken down by blasting is trucked from the quarry face to the primary crusher, whence it travels over belt conveyors and by gravity to the scalping screens, secondary crushers, final reduction crushers, and rotary sizing screens, to find its resting place in one of the 18 reinforced concrete storage bins. These bins have a total capacity of about 5,000 tons, in sizes ranging from "dust" to 2-in.,

Conveyors from tunnels beneath stone and sand stock-piles.

Conveyor to central-mixing plant, with shovel in foreground.



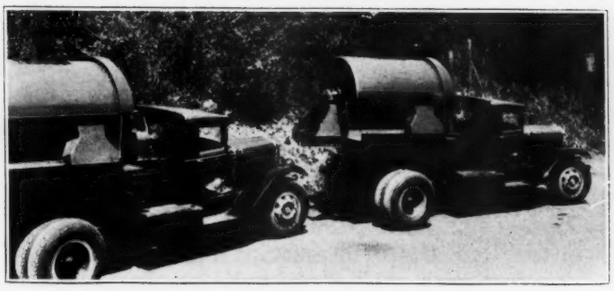
Fleet of trucks at the storage bins below crushing plant.

with three driveways underneath for truck-loading. When the bins are full, the excess output of the plant is trucked to stock-piles on the hillside below.

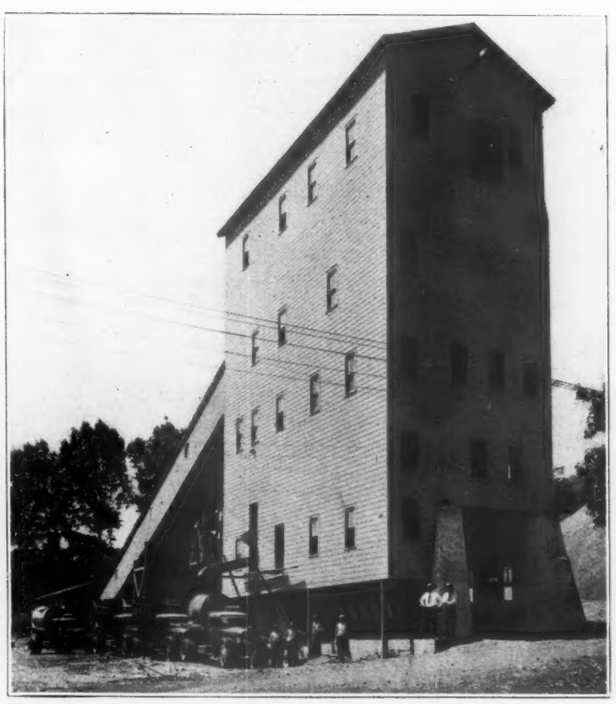
Near these stock-piles, two Blaw-Knox 3-compartment, 300-ton batcher bins were set up, side by side. The batching hopper of one bin is so arranged that it can discharge dry mix (stone, sand, and cement) into transit-mix trucks driving underneath or into a Ransome 3-cu. yd. mixer which discharges wet mix into agitator trucks on one side. The other bin is for batching stone and sand for concrete road work, multi-batch trucks driving underneath it. All aggregates, whether stone, sand, or cement, are proportioned by weight.

Three-compartment bins were necessary on account of New Jersey State Highway Dept. specifications which, this year, call for a mixture of two sizes of coarse aggregates, in addition to the fine aggregate, sand; i. e., 1½-in. and ¾-in., or 1-in. and ⅝-in. crushed stone or gravel, which must be combined at the batcher.

Between the bins and the stone stock-piles are two large timber hoppers, on concrete piers, so arranged that they can be filled by trucks or by the



Trucks with drum-type bodies for carrying concrete.

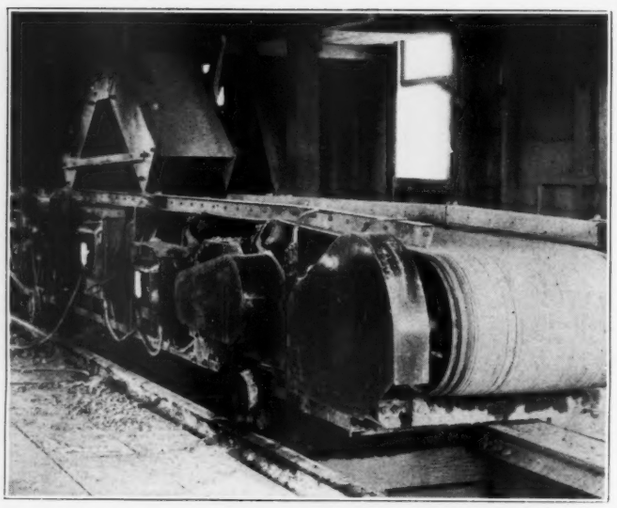


Concrete plant from the mixer-discharge side.

UNIVERSITY OF MICHIGAN LIBRARIES

firm's shovel, a Marion Type 7 with ¾-cu. yd. dipper. One of these hoppers is for stone and the other for sand, the latter aggregate being brought in by truck from a sand-washing plant about 5 miles distant. Under each of these hoppers, in a tunnel and fed by overhead gates, is a 24-in. by 70-ft. belt conveyor which feeds onto a 24-in. by 190-ft. belt conveyor running up a 20-deg. incline to a discharge, through a 2-way spout, onto a 24-in. by 21-ft. shuttle belt conveyor over the bins. A geared winch, connected with one set of wheels on the shuttle conveyor, makes moving the latter an easy matter and permits direct discharge into any one of the six bin compartments.

Over the tail end of the 190-ft. belt conveyor is



The 21-ft. shuttle conveyor under the two-way spout.

an auxiliary hopper so that trucks can dump stone and sand direct to that belt.

Cement is brought by truck and stored in a 20-ft. by 40-ft. shed located under the 190-ft. conveyor. Here the bags are opened and the loose cement dumped through a grizzly in the floor into the hopper of an 18-in. by 140-ft. belt conveyor which runs up, on an incline of 20 deg., to a cement hopper on the side of one of the batcher bins, whence a screw conveyor takes the cement to a weighing hopper.

Both the 190-ft. conveyor and the 140-ft. cement conveyor are supported on the floor of "galleries" measuring approximately 7 ft. by 7 ft., inside dimensions. These galleries are formed by double-latticed timber-side trusses, roofed over and sheathed with clapboards. Two timber towers at the center of their lengths, reduce the clear spans of the trusses to about 70 ft. The two feeder conveyors under the stock-piles are supported on timber A-frames.

All the belt conveyors for this new central-mixing plant were supplied by Barber-Greene Co. and are of that company's standardized steel-frame, sectional construction. The belting used is of 5-ply, 28-oz. duck, ⅛-in. rubber cover, manufactured by Diamond Rubber Co. The motors used were manufactured by General Electric Co.—25-hp., slip-ring

Looking down belt conveyor to hopper. Cement storage at rear.

type on the 190-ft. conveyor, 15-hp. on the cement conveyor, 10-hp. on each of the feeder conveyors, and 5-hp. on the shuttle conveyor.

This year, the firm purchased fourteen new General Motors Co. trucks, ten of which carry dump bodies; while four are for transporting wet-mix concrete, two being equipped with Clinton drum-type bodies, and two with Blaw-Knox open-top agitator bodies.

Rubber Industry Lays Down Rigid Specifications for Lime

The specifications for lime for the rubber industry are very rigid. The lime must be thoroughly calcined, leaving very little carbonate. As used for vulcanization, the hydrate must be absolutely free from calcium oxide, that is, it must be thoroughly hydrated and must not contain a trace of manganese or copper. Aside from carbon dioxide and magnesia, either as oxide or hydroxide, it should not contain over 3 per cent impurities. The impurities act not only as diluents but, in cases of white or colored products, are very apt to cause discoloration by the formation of dark colored sulphides. The lime should be very fine and free from grit.

One large producer of rubber goods purchases lime by the following specifications:

Hydrated lime (high-magnesium lime percentage): moisture, 0.20; fineness (passing 200-mesh sieve) 100.00; loss on ignition, maximum 16.0-17.0; silica and insoluble material, maximum 0.35; iron and alumina (R_2O_3) maximum, 0.35; magnesium oxide as MgO, minimum 32.06; lime as Ca, minimum 47.75.

Hydrated lime (high-calcium lime percentage): moisture, 0.20; fineness (passing 200-mesh sieve) 100.00; loss on ignition, maximum, 24.0-26.0; silica and insoluble material, maximum, 1.50; iron and alumina (R_2O_3) maximum 1.10; magnesium oxide as MgO, (max.) 1.25; lime as Ca, minimum 70.75.

In addition, the lime must pass an experimental curing test with rubber and sulphur of known and proved quality.

Solves Problem of Hauling Rock Asphalt with 3½-Mile Aërial Tramway*

By GAIL MARTIN

NEAR Sunnyside, Utah, at the crest of the Book Cliff Mountains, an enterprise has been started that has for its objective the conversion of a mountain of rock asphalt into many thousands of miles of highway pavement.

Early in the history of Utah, pioneers in the territory now embraced in the state discovered vast deposits of bitumen. Attempts were made to exploit these resources. In 1891, Commercial Street, in Salt Lake City, was surfaced with rock asphalt; in 1896, Second South, between West Temple and First West; and, in 1895, Richards Street. In 1905 a ¾-in. layer was laid on bare dirt around the city and county building in Salt Lake City. These pavements are now in as good conditions as when first laid.

Engineers and financiers who considered exploiting the deposit now being developed by the Utah Rock Asphalt Co. faced insuperable difficulties that forced them to retire from the field with heavy losses. A rugged terrain, which rises nearly 3,000 ft. above the Denver & Rio Grande Western R. R. terminal at the coal camp of Sunnyside, defied all ordinary methods of transportation. To overcome this handicap, mining had to be conducted on a large-tonnage basis. At that time a market sufficient to justify operations of this type did not exist and could not be developed by inadequately financed companies.

Events of the last few years, however, have removed the two chief obstacles to development of the Book Cliffs asphalt deposits. The need of highways has created a market of tremendous proportions. Transportation difficulties have been obviated by the construction of a 3½-mile rope tramway by the Utah Rock Asphalt Co. The open-pit mine of the company has been equipped with power machinery, and a mill, with a capacity of 1,400 tons daily, has been built at Sunnyside.

During the Tertiary age, pure silica sand was deposited by an inland sea. Subsequent pressure transformed this sand to sandstone. Later, asphaltic oil, highly volatilized and under enormous pressure, penetrated this sandstone to great depths and over wide areas, not only coating the sand but filling pores and voids. In Utah are deposits of asphaltic rock and sands where the quantity of bitumen is too high to permit the use of the mixture for road surfacing without the application of heat and inert material; but at Sunnyside the proportion of asphalt, ranging from 8 to 11 per cent, makes the product ideal for road building.

From summit to base, the stratum of rock asphalt measures 1,000 ft. Outcrops appear along the face of the Book Cliffs for 17 miles. So vast is the visible supply in this area that the engineer who tries to compute tonnage becomes lost in a maze of figures of astronomical magnitude. The principal holdings of the Utah Rock Asphalt Co., near Sunnyside, are estimated to contain 10,000,000,000 tons of rock asphalt, on the basis of 110 lb. to the cubic foot. About half of this amount, it is estimated, would pave all of the roads in the world, amounting to 6,582,000 miles, according to U. S. Department of Commerce statistics.

With the solution of the transportation problem, the outlook for the Carbon County rock-asphalt industry takes on a changed aspect. Rock asphalt can now be conveyed from the mine to the terminal base in Whitemore Canyon at the rate of 720 tons daily, which capacity can be doubled when necessity requires. The rock is dumped into eight 5-ton loading pockets, and then loaded into trucks.

A fleet of four 5-ton Federal trucks hauls the material to the mill at Sunnyside, 2 miles distant. As soon as market conditions justify, the company plans to move its mill to the lower tramway terminal, and to build two miles of railroad from Sunnyside up the canyon. Rock will then be dumped directly into the mill from the tram buckets and the crushed rock asphalt loaded from the mill into railroad cars.

In mining the rock asphalt, benches, from 6 to 8 ft. wide, are cut in the side of the asphaltum cliff by

Road at Spring Canyon, Carbon County, Utah, constructed of the mined product.

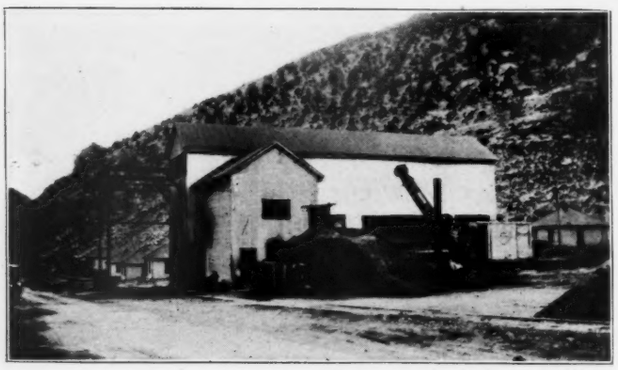
* Reprinted from *Engineering and Mining Journal*, for Oct. 9, 1930.

UNIVERSITY OF MICHIGAN LIBRARIES

drilling 12-ft. holes, 3 ft. from center to center, with No. 5 Ingersoll-Rand Jackhammers and 1-in. steel. The holes are loaded with 40- or 60-per cent dynamite, depending on the character of the rock. Several hundred tons of rock are blasted down at a time. Nearness of the face to the tramway terminal prevents heavier loading of the holes. Because of its "rubbery" quality, dynamite does not produce the shattering effect that is produced in limestone or shale. The overburden covering the asphaltum averages from 10 to 30 ft. In some places, high-grade material comes nearly to the surface.

Faces are sampled and numbered so that the asphalt rock may be maintained at the desired grade of 9 to 11 per cent bitumen. Large pieces of rock are drilled and shot to reduce them for loading on the American Steel & Wire Co. cars. A 60-hp. Osgood Commander heavy-duty gasoline shovel is used to load the overburden. A 10-ton Linn 75-hp. tractor, self-dumping type, hauls the overburden to the dump. Tram buckets have a capacity of 1,000 lb. each. The tramway was designed and erected by the American Steel & Wire Co.

At the mill, the rock is dumped into a 300-ton bin. Cast-iron bars, 1 in. by 6 in. by 3 ft., placed at regular intervals, cover the belt conveyor. These bars are raised so that the material can feed to the belt



Plant of the Utah Rock Asphalt Co.

and the bin can be unloaded from front to back. A Jeffrey 36-in. belt conveyor carries the rock to a Jeffrey elevator. From the elevator, the rock asphalt is fed to an Allis-Chalmers 24-in. by 36-in. jaw crusher which breaks the feed to 6 in. or less in size. A Jeffrey elevator raises the rock to an Anaconda No. 2 smooth-roll crusher which breaks the feed to 3 in. or less. The ore is then elevated to a Hum-mer screen, maximum ½ in., where the fine material is bypassed to the hydrator.

The feed is next put through an Anaconda corrugated roll crusher of the same size as No. 2. From the No. 3 crusher, the asphalt is passed over two Hum-mer screens, maximum ½ in., that operate in tandem. Fines from the screen are fed directly to the hydrator, and the oversize is conveyed to a Williams hammermill, in closed circuit with the tandem Hum-mer screens. The hydrator consists of a 4-ft. by 12-ft. steel cylinder, where a fine needle spray of water increases the moisture content to 4 per cent.

The mill feed is so gummy that it sticks to every-

A 75-ft. face of rock asphalt at Sunnyside, Utah.

thing it touches, coating the machinery, floors, and woodwork. At the end of each 8-hour shift, crushing machinery and screens and conveyors must be given a thorough cleaning.

Addition of water prevents the crushed material from reuniting into a compact mass during the journey by rail. The water coating given the asphalt adds but little weight and is a real benefit in the smoothing and rolling process on the roadbed. In shipment, only a comparatively thin film of cement asphalt forms on the top, the bottom and side covering effectively preventing any great loss of moisture during a long haul. By this method, shipments were made with success last year as far south as Santa Fé and as far east as Chicago.

The writer wishes to acknowledge indebtedness for the information contained in this article to Howard C. Means, former Utah state road engineer and now in charge of the activities in Utah and the western states for the Utah Rock Asphalt Co., and to William H. Haywood, superintendent.

Portland-Cement Production Higher in Provinces Last Year

Canadian cement production set up a new high record in 1929, according to finally revised statistics just issued by the mining, metallurgical and chemical branch of the Dominion Bureau of Statistics at Ottawa. Shipments during 1929 totalled 12,284,081 barrels valued at $19,337,235 as compared with 11,023,928 barrels worth $16,739,163 produced in 1928.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

© Blank-Stoller, Inc

F. R. BISSELL
Chairman of the Board
International Cement Corp.
New York, N. Y.

UNIVERSITY OF MICHIGAN LIBRARIES

Personal Mention

William E. Barker, paving engineer in the highways bureau at Portland Cement Assn. headquarters, Chicago, is the proud father of a son, William, Jr., born Oct. 12. Mr. Barker is well known throughout the cement industry for his efforts in establishing and conducting short courses in the design and construction of concrete pavements, which have been held in the important cities of the United States in recent years.

George Parnell of Bellefonte, Pa., sales manager of the American Limestone Co., spoke before the members of the Curivensville, Pa., Rotary club recently. His subject was "The Romance of Lime."

C. G. Carter, chief chemist of Canada Cement Co. Plant No. 3 at Hull, Quebec, Can., recently left on an extended trip to England where he will visit relatives. He will return to Hull early in December. During Mr. Carter's absence, **R. F. Haskett,** assistant chemist, will attend to his duties.

N. D. Crowley, president and general manager, Ready Mixed Concrete & Supply Co., Albany, N. Y., who was seriously injured several months ago in an automobile accident, has sufficiently recovered to resume some of his duties.

F. F. Beall was elected to the board of directors of Continental Motors Corp. at the regular monthly meeting of the board last month. Mr. Beall has had a wide experience in the automotive field and will strengthen materially the Continental organization. He received his early training with Brown & Sharpe Co. Since then his activities have been many and varied. It is understood that he will devote a considerable part of his time to Continental's interests.

William Ogden, who has been manager of the Manufacturers' Division of the American Road Builders' Assn., has resigned. His successor has not been named. Meanwhile, **Chas. Upham,** executive-secretary, will handle matters pertaining to the Manufacturers' Division.

Emil Hansen, formerly secretary and sales manager, who has been connected with the Paragon Plaster Co., Syracuse, N. Y., since 1908, has been elected to fill the offices of treasurer and general manager, succeeding W. K. Squier, who died Oct. 12. **C. T. Woodworth** was named secretary and **A. H. Mercer, Jr.,** becomes assistant treasurer.

R. A. Schoenfeld, for the past seven years sales manager of the Claud S. Gordon Co., Chicago, has been made sales engineer, with headquarters in the Chicago district office, of the Hevi Duty Electric Co., Milwaukee.

Thomas W. Pangborn.

Thomas W. Pangborn, president of The Pangborn Corp., recently addressed an open letter to the mayor and city council of Hagerstown, Md., offering to lend $50,000 to be expended for public work conditioned upon the willingness of others to coöperate in the plan to the extent of raising an additional sum of $200,000, with the idea of aiding the unemployment situation. The quarter of a million dollars would, it is believed, almost entirely eliminate unemployment among worthy citizens of the city. In the letter to the mayor and council, it was suggested that a commitee of three be selected by subscribers to the fund to act with the mayor in an advisory capacity in selecting the character of public work to be undertaken.

E. S. Black, formerly assistant to the president of the American Manganese Steel Co., Chicago, has been appointed research engineer of the Pettibone Mulliken Co., Chicago.

Percy H. Johnson, banker, and **Victor N. Roadstrum,** attorney, both of New York, have been elected directors of the Pennsylvania-Dixie Cement Corp.

Harvey W. Smith of Canton, O., has joined the firm of Bacon, Hibbard, Eichman, Inc., equipment and supply house of Cleveland, O. The name of the concern has accordingly been changed to Hibbard, Eichman, Smith, Inc.

John E. Whisenand, Green River Sand & Gravel Co., Green River, Wyo., writes that he has purchased the sand and gravel business of **Mrs. Christine Irvine** at Green River.

Leathem D. Smith, of Sturgeon Bay, Wis., head of the Leathem D. Smith Dock Co., builders of self-unloading boats, has organized and heads a new gravel-dredging concern known as the Sound Gravel Co. Offices are in New York.

C. F. Messinger, vice-president of the Chain Belt Co., Milwaukee, Wis., has been elected general manager. **H. S. Greene,** formerly with the Barber-Greene Co., of Aurora, Ill., succeeds him as general sales manager. **Brinton Welser,** formerly secretary, was elected director and vice president. **J. C. Merwin** was re-elected as vice-president. **A. R. Albelt** was elected secretary and continues in charge of chain sales. **W. H. Brandt,** formerly assistant secretary, becomes assistant to the president.

J. T. Conners, who is well known in the shovel field, having been the Thew Shovel Co. district manager in Detroit for a number of years, has gone with the American Hoist & Derrick Co., of St. Paul, Minn. Mr. Conners will have charge of American Gopher sales in the field.

Obituary

M. J. Scanlon of Minneapolis, a vice-president of the Trinity Portland Cement Co. of Dallas, Tex., died at his home recently.

Carl F. Bierbauer, 51, superintendent of the Hercules, Cal., explosives plant of the Hercules Powder Co., died suddenly Oct. 28 of heart disease. Mr. Bierbauer was former director of the Hercules Experimental laboratories, and was a chemical engineer of outstanding ability. He was an active member of the American Chemical Society and the American Institute of Chemical Engineers. His sudden passing was a distinct shock to friends and associates. Born at Girard, Pa., in 1879, Mr. Bierbauer attended Pennsylvania State College, graduating in 1902. After periods of service with United Gas & Coke Co., International Nickel Co., and New Jersey Zinc Co., he joined the Hercules organization in 1915.

William Piez, European correspondent of Link-Belt Co., and a brother of Charles Piez, chairman of the board of the company, died at Brussels, Belgium, on November 2 after a week's illness of pneumonia. Previous to his association with Link-Belt, the deceased was district manager of the Concrete Steel Co. of Chicago. Since 1928 he lived at Paris, France, where he functioned as European correspondent of Link-Belt Co. He was born at Newark, N. J., in 1878.

Coming Events

Dec. 1-5, 1930, Memphis, Tenn. Ninth Annual Asphalt Paving Conference of the Asphalt Institute. Meeting of the Association of Asphalt Paving Technologists in conjunction.

Dec. 1-6, 1930, New York, N. Y. Ninth National Exposition of Power and Mechanical Engineering, to be held at Grand Central Palace. I. E. Moultrop, chairman.

Dec. 11-12, 1930, Washington, D. C. Special meeting, Highway Research Board of National Research Council.

Jan. 12-16, 1931, St. Louis, Mo. Annual convention and show, American Road Builders' Assn. Chas. M. Upham, engineer-director, National Press Bldg., Washington, D. C.

Jan. 19-22, 1931, St. Louis, Mo. Annual Convention National Crushed Stone Assn., Hotel Jefferson. J. R. Boyd, secretary, 1735 14th St., N. W., Washington, D. C.

Jan. 26, 1931, St. Louis, Mo. Annual convention of National Ready-Mixed Concrete Assn. New Hotel Jefferson. J. C. Eakin, secretary, Little Rock, Ark.

Jan. 27-29, 1931, St. Louis, Mo. Annual convention National Sand & Gravel Assn., Hotel Jefferson. V. P. Ahearn, executive secretary, Washington, D. C.

Feb. 10-13, 1931, Chicago, Ill. Fifth Midwest Power Engineering Conference. G. E. Pfisterer, secretary, 308 W. Washington St., Chicago.

Feb. 24-27, 1931, Wichita, Kan. Sixth Annual Southwest Road Show and School, Exposition Building. F. G. Wieland, manager, P. O. Box 1043, Wichita, Kan.

April 13-18, 1931. Cleveland, O. National Industrial Equipment Exposition, in connection with Congress on management, maintenance and materials-handling of A. S. M. E. G. E. Pfisterer, managing director, 308 W. Washington St., Chicago, Ill.

May 4, 1931. New York, N. Y. Thirteenth exposition of Chemical Industries, Grand Central Palace. International Exposition Co., managers, Grand Central Palace, New York.

Application of Welding Rod Prolongs Life of Crusher Mantles

Recent tests by a mining company in Northern California have shown the application of Hascrome welding rod to worn crusher mantles to be highly successful. The average life of a manganese-steel mantle for crushing copper pyrites was found to be approximately six months. At the end of this time the 2½-in.-thick metal is practically worn through. One of these castings was reclaimed after being taken out of service by building up the worn surface with Hascrome. Ninety pounds of this material was used, requiring 25 hr. of labor to apply it. The total cost of rebuilding, including overhead, amounted to slightly more than 25 per cent of the cost of a new mantle. At the end of four months, this part, having crushed 28,000 tons of ore, showed but 5/32 in. of wear. It was again recoated and put back into service.

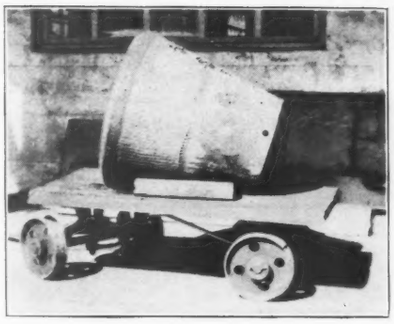
Another mantle, reclaimed with Hascrome, was examined at the end of three months. It had worn about ⅛ in. while crushing 21,000 tons of the same ore. This was also built up to the desired size and put on the job once more. Since then this company has sent three more mantles to their shop for reclamation, which shows how convincing the results have been.

In the Salt Lake district of Utah a smelting and refining company built up a "two-piece" crusher mantle, using 125 lb. of Hascrome. It was put in service in December, 1929, and is still in perfect condition. The saving over the cost of a new one in this case was practically 60 per cent; and, subsequent to the results obtained from the first casting, this company had adopted reclaiming with Hascrome as standard practice for all its gyratories. Had this mantle been of one-piece construction and of larger size, the percentage of saving due to reclamation instead of replacement would have been even higher.

The welding procedure for resurfacing these castings was in accordance with the standard practice for applying Hascrome by the electric arc method. Reverse polarity was used: namely, the ¼-in. Hascrome rod was made the positive electrode. A current of from 200 to 250 amp. was found to be most desirable. It is not always necessary to use a flux coating on the rod, for excellent results have been obtained without it. However, if a flux coating seems desirable, it can readily be made up by mixing some brazing flux with carbide sludge and water. Both methods of laying down the electric beads longitudinally and circumferentially have been tried, and from the results obtained, either procedure is satisfactory. However, general practice seems to favor the longitudinal bead: that is, parallel to the axis of the mantle.

Best results are obtained if the coating is applied at irregular intervals around the mantle. If the rod is used alternately at perhaps the quarter points, there is less danger of warping the piece because by this method the welder will not get the casting too hot by concentrating the heat at one point. In this manner the danger of undue strains and cracks is materially reduced. It is more economical to rebuild the worn surfaces after the mantle has been slightly reduced in size than to wait until the metal has been ground almost entirely away. It is possible for the company shops to thus utilize time that would ordinarily be wasted and so cut down shop overhead by applying Hascrome to these large castings as fill-in work.

Hascrome is manufactured by the Haynes Stellite Co.



Typical gyratory crusher mantle.

Book Review

CHEMICAL ENGINEERING CATALOG, fifteenth annual edition. Chemical Catalog Co., Inc., 419 Fourth Ave., New York, N. Y.

This volume of 1,168 large pages is issued as an aid to plant operators who have occasion to purchase corrosion- and heat-resistant metals and alloys, material-handling machinery, valves and fittings, pumps, power-transmission equipment, steam specialties, power-plant equipment, electrical equipment, chemicals, heat-transfer equipment, control instruments, raw materials, or technical books. The book contains indexes arranged alphabetically by company names, trade names, and products. The products of six hundred manufacturers are covered, and the advertising pages, in themselves, comprise an encyclopedia of every kind of supply or equipment that enters into the industries that are included within the broad scope of chemical engineering.

The book is distributed in the United States and Canada, to officials of industrial plants and laboratories, by mail postpaid: (1) free of charge, with the understanding that it will be returned upon publication of the next edition, (2) for $3, the copy to be retained permanently. The price of the book is $10 to those not connected with chemical or allied industries.

UNIVERSITY OF MICHIGAN LIBRARIES

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

United States Gypsum's Net Quite Encouraging

The net income of United States Gypsum Co. for the nine months ended September 30, 1930, is said to approximate $3,975,000, or around $3.40 per share of the common stock. While no direct comparison with 1929 is available, the net for the year ended December 31, 1929, totaled $5,102,305, or $3.98 per share.

In the first six months of this year, the net amounted to $2,891,750, equal to $2.24 per share, against $2,329,244 or $2.70 per share on a smaller capitalization in the same period of last year.

The next meeting of the directors of United States Gypsum Co., to be held shortly, it is understood, will consider listing the company's stock on the New York Stock Exchange. It is known that such an action has been pending for some time, but that the acquisition of new companies through an exchange of stock has acted as a deterrent. The move is contemplated through a desire to provide a broader market for the stock.

General Asphalt Stock Is Placed on $3 Basis

General Asphalt Co. declared a quarterly dividend of 75 cents, payable December 15, to stock of record December 1. This places the stock on an annual basis of $3, comparing with $1 per share, paid quarterly since December, 1929.

The company and its subsidiaries report for the quarter ended September 30, 1930, a net profit of $634,147, after depreciation, federal taxes, equivalent to $1.53 per share on 413,333 no-par shares of common stock, including 6,921 shares of old $100-par common stock not yet exchanged and 43 shares represented by voting trust certificates not yet exchanged. This compares with a net income in the third quarter of 1929 of $783,656, or $1.89 per share, based on the same number of shares.

The net income for the nine months ended September 30, 1930, was $840,827 after above charges, equal to $2.03 per share on 413,333 shares of stock which will be outstanding when all the old stock has been exchanged; comparing with $1,245,416 or $3.01 per share in the first nine months of the preceding year.

For the six months ended June 30, the company reported net profit of $260,680, equivalent to 50 cents a share on 413,333 shares of no-par common stock, which compared with $416,760, which was equivalent after dividend requirements on the 51-per cent preferred then outstanding to $1.41 per share on 210,614 shares of common stock.

Current assets on September 30 totaled $7,323,968, of which $2,123,009 was in cash, as against current liabilities of $696,689, a ratio of better than 10 to 1. This compares with current assets of $8,360,765, of which $3,106,640 was in cash, and current liabilities of $968,888, a ratio of nearly 9 to 1, as on December 31, 1929. The earned surplus on September 30 totaled $8,964,147, contrasted with $9,254,292 on December 31, 1929.

International Cement's Estimated Earnings Up

International Cement Corp. estimates its net profit, after federal tax for October, at $356,000, compared with $277,000 for October, 1929. The net profit for the first ten months of the current year is estimated at $3,803,000, against $3,805,000 in the similar period of last year.

Earnings for October, 1930, are equivalent to 56 cents per share and, for the ten months, to $5.98 per share on the 635,763 shares now outstanding. This compares with 44 cents per share for October, 1929, and $6.06 per share for the ten months of 1929 on 627,524 shares then outstanding.

Duval Texas Sulphur Co. Reports for 11 Months

The report of Duval Texas Sulphur Co. for the period Oct. 1, 1929, to Aug. 31, 1930, shows a net profit, including $10,314 profit from sale of capital assets, of $241,855, after taxes, interest, depreciation and depletion, equivalent to 48 cents per share on 500,000 no-par shares of capital stock. The gross for the period was $920,318.

The balance sheet as of Aug. 31, 1930, shows total assets of $11,627,445. Current assets amounted to $490,603 and current liabilities $264,400.

Alpha Portland Cement 12-Months Net Is Lower

The report of Alpha Portland Cement Co. for twelve months ended September 30, 1930 shows net income of $1,280,017 after depreciation and federal taxes, equivalent, after preferred dividend requirements, to $1.60 a share on 711,000 no-par shares of common stock. This compares with $1,989,345 or $2.60 a common share in the twelve months ended September 30, 1929.

See Big Winter Cement Demand in the Far West

The Pacific Coast Cement Co. will operate its plant at Seattle at full capacity throughout the winter, according to E. C. Ward, president, who is reported to have also declared that 24-hour operation seven days a week is in prospect. The company's quarries at Dall Island, Alaska, are operating at capacity.

Adolph Krabbe, general superintendent of the Olympic Portland Cement Co. plant at Bellingham, Wash., reports that the Olympic mill is operating at capacity with prospects for continued high production. Construction of the Rock Island dam at Wenatchee, Wash., is taking a large portion of the Olympic plant's output.

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE	COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
Alpha Portland Cement	Preferred	1¾% qr.	Dec. 1	Dec. 15	Material Service Corp.	.....	$0.50 qr.	Nov. 15	Dec. 1
American Brick Co.	Preferred	$0.50 qr.	Oct. 25	Nov. 1	Metropolitan Paving Brick	Common	$0.50 qr.	Nov. 15	Dec. 1
Bessemer Limestone & Cement	Class A	$0.75 qr.	Oct. 19	Nov. 1	Missouri Portland Cement	.....	$0.50 qr.	Oct. 19	Nov. 1
Canada Paving and Supply	1st Pfd.	1¾% qr.	Nov. 15	Dec. 1	Pacific Clay Products	.....	$0.60 qr.	Oct. 20	Nov. 1
Cleveland Stone Quarries	Common	$0.75 qr.	Nov. 15	Dec. 1	Riverside Cement	1st Pfd.	$1.50 qr.	Oct. 15	Nov. 1
Consolidated Sand and Gravel	Preferred	1¾% qr.	Oct. 30	Nov. 15	Riverside Cement	Class A	$0.31¼ qr.	Oct. 15	Nov. 1
Construction Materials	Preferred	$0.87½ qr.	Oct. 24	Nov. 1	Standard Paving and Materials, Ltd.	Preferred	1¾% qr.	Nov. 2	Nov. 15
General Asphalt	Preferred	1¼% qr.	Nov. 15	Dec. 1	Standard Paving and Materials, Ltd.	Common	$0.50 qr.	Nov. 2	Nov. 15
General Asphalt	Common	$0.75 qr.	Dec. 1	Dec. 15	Superior Portland Cement	Class A	$0.27½ M	Nov. 23	Dec. 1
Indiana Limestone	Preferred	1¾% qr.	Nov. 20	Dec. 1	Virginia Carolina Chemical	Pr. Pfd.	1¾% qr.	Nov. 17	Dec. 1
Kentucky Consolidated Stone	Preferred	1¾% qr.	Oct. 15	Nov. 1	Wolverine Portland Cement	.....	$0.15 qr.	Nov. 5	Nov. 15
Kentucky Rock Asphalt	Preferred	1¾% qr.	Nov. 15	Dec. 3	Worcester Salt Co.	Preferred	1½% qr.	Nov. 10	Nov. 15
Lawrence Portland Cement	.....	1% qr.	Nov. 31	Dec. 15					
Lehigh Portland Cement	Common	$0.62½ qr.	Oct. 14	Nov. 1					

Traffic News and Comment

A regular feature of this department in the future will be a condensed summary of complaints before the Interstate Commerce Commission that affect the industry and are of general interest to readers. While it will be impossible to give the examiner's report in detail in all cases, the essential recommendations will be published. Those dockets of the various rate committees which are of general interest will be included in each issue.

Questions from readers on any phase of traffic are invited. Readers having trouble with claims, with the interpretation of a tariff, rate adjustments or freight service, or other traffic problems should address the Editor. Letters will be answered either direct promptly or the answers will be published in these columns. Comments from readers will always be welcome.

Recent I. C. C. Decisions

Granite

The rates on rough granite from Rockton, S. C., and South Ryegate, Vt., to St. Cloud, Minn., are unreasonable to the extent that they exceed the rate in effect from the above points to Duluth, Minn. Reparation was awarded. I. C. C. Docket 22,515. Jones Monumental Works et al. v. Great Northern Ry. et al.

Sand

The carriers have been ordered to publish rates on sand, effective not later than Jan. 12, 1931, from Massaponax, Va., to Paschall, N. C., not to exceed $1.35, and from Puddledock, Va, to Paschall, N. C., not to exceed $1.05. Reparation was awarded. The rates now in effect are $1.66 from Massaponax and $1.46 from Puddledock. I. C. C. Dockets 22,649, Atlantic Paving Co. v. R. F. & P. et al., and 22,825, Atlantic Paving Co. v. N. & W. et al.

New Complaints Filed

Molding Sand

A complaint of unreasonableness has been made regarding the rates on molding sand from Elnora, Glenmont and Albany, N. Y., to Beaver Dam, Wis., and reparation has been asked, in I. C. C. Docket No. 23,912 Malleable Iron Range Co., Beaver Dam, Wis., v. A. A. et al.

Proposed Rate Changes

New England Freight Assn.

Magnesite

The carriers have proposed a reduction of the rate on magnesite, deadburned or calcined, from Chippewa, Ont., to Worcester, Mass. The present rate is 47 cents and the proposed rate 35 cents.—Docket No. 20,988.

Sand

A reduction of the rate on core and molding sand from Lynn, Mass., to Everett, Mass., is proposed by the carriers to meet barge competition. The present rate is 10 cents per 100 lb., carload minimum weight 90 per cent of the marked capacity of the car, except that, when cars are loaded to cubical or visible capacity, actual weight will apply. The proposed rate is 90 cents per net ton.—Docket No. 21,060.

* * *

Illinois Freight Assn.

Agricultural Screenings

The carriers have been asked to reduce the rates on agricultural screenings or dust (fertilizer limestone) from Falling Springs, Ill., to points in Illinois Rate Committee territory. Representative changes covered in Docket No. 5,913 are:

To	Rates per Net Ton Present	Proposed
Clores, Ill.	$2.00	$0.70
Jamestown, Ill.	1.90	0.80
Mt. Vernon, Ill.	2.00	0.90
Percy, Ill.	1.90	0.70
Scheller, Ill.	2.10	0.90

Crushed Stone

Changes are proposed in the rates on crushed stone, carload minimum weight marked capacity of car, from Stolle, Ill., to N. Y. C. & St. L. Ry. stations. Present and proposed rates in Docket No. 5,914 are:

To	Rates per Net Ton Present	Proposed
Donnellson, Ill.	$1.07	$0.86
Kaufman, Ill.	0.98	0.86
New Douglas, Ill.	0.98	0.86
Panama, Ill.	1.07	0.86
Sorento, Ill.	0.98	.086

A reduction in the crushed-stone rate from Buffalo, Ia., to Davenport, Ia., has been asked. The present rate is 41 cents per net ton and a rate of 35 cents is proposed in Docket No. 5,932.

Shippers have asked for a reduction in the rate on lime rock or limestone (broken, crushed or ground) in carloads, from Mosher and Ste. Genevieve, Mo., to Peoria, Ill. The present rate is $2.10 per net ton, and a rate of $1.75 has been sought in Docket No. 5,933.

Novaculite Gravel

Establishment of a commodity rate on Novaculite Gravel of 88 cents per net ton, minimum carload weight 90 per cent of the marked capacity of car, is proposed from Olive Branch and Wiggs Spur, Ill., to Gravel Pit and Elko, Ill.—Docket No. 5,915.

Quarry Refuse

A reduction of one cent per 100 lb. is proposed on limestone-quarry refuse, consisting of dirt and stone, minimum weight marked capacity of car, from East St. Louis, Ill., to Spanish Lake, Mo. The present rate is 8 cents per 100 lb.—Docket No. 5,938.

Sand

Commodity rates are asked on sand (blast, engine, foundry, glass or molding) carload minimum weight marked capacity of car, from Bowes, Ill. The proposed rate to Champaign and Springfield, Ill., is $1.76 per net ton, and to Madison and Waukesha, Wis., $1.40 per net ton. Class rates now apply.—Docket No. 4,574-Sub. 3.

Reductions are proposed in the silica-sand rates from Browntown, Wis., to various destinations in Iowa. Changes to be considered in Docket No. 5,927 are:

To	Rates per Net Ton Present	Proposed
Buffalo, Ia.	$2.00	$1.60
Burlington, Ia.	Comb'n't'n rates	2.00
Linwood, Ia.	2.00	1.60
Montpelier, Ia.	2.00	1.60
Muscatine, Ia.	2.00	1.60

Sand and Gravel

Joint through rates on sand and gravel, except blast, engine, foundry, glass or molding sand, carloads, from Golconda, Ill., to Mount Vernon, Ill., to replace the present combination rates are being considered in Docket No. 5,924. The proposed rates per net ton and the specified routes are: $1.00 via Illinois Central, Tamaroa, Missouri Pacific; $1.20 via Illinois Central, Centralia, Southern; $1.13 via Illinois Central, Ashley, Louisville & Nashville; $1.00 via Illinois Central, Marion, Chicago & Eastern Illinois.

The establishment of joint through rates on sand and gravel, carloads, from Browntown, Wis., to stations on connecting lines in Illinois is proposed. Rates are now made on a combination of locals. Representative proposed rates in Docket No. 5,926 are:

To	Proposed
Addison, Ill.	$1.28
Bloomington, Ill.	1.68
Downer's Grove, Ill.	1.48
Kewanee, Ill.	1.61
Mundelein, Ill.	1.35
Zearing, Ill.	1.61
Wataga, Ill.	1.73

* * *

Southern Freight Assn.

Calcite

Initiated by shipper; rates suggested by carrier. It is proposed to establish rates on calcite (ground or pulverized, ground or pulverized limestone or marble), carloads, minimum weight marked capacity of car, except that, when car is loaded to full visible capacity, actual weight will apply, to Chardon, O., from Cartersville, Ga., $5.78, and from Sparta, Tenn., $5.71 per net ton, same as at present applicable to Ashtabula, O. Cincinnati, O., combination now applies.—Docket No. 52,389.

Cement

Initiated by carrier. It is proposed to cancel on the obsolete theory, the present published commodity rates on

UNIVERSITY OF ILLINOIS LIBRARY

cement from Sandersville, Ga., to all destinations shown in Agent Glenn's Tariff 41-D, I. C. C. No. A-718.—Docket No. 52,454.

Crushed Marble

Shippers have made the following proposal, the basis having been suggested by the carriers. Crushed marble or marble chips, minimum weight 90 per cent of the marked capacity of the car, except that, when the car is loaded to full visible capacity, actual weight will apply: from New Orleans, La. (applicable from shipside), to: Baton Rouge, La., $1.15; Jackson, Miss., $1.55; Meridian, Miss., $1.61; Birmingham, Ala., $2.07; Montgomery, Ala., $1.90; and to Chattanooga, Tenn., $2.47 per net ton. The proposed rates are 115 per cent of the I. C. C. 17,517 scale.—Docket No. 52,-332.

Crushed Stone

The carriers propose to establish an estimated weight on crushed stone of 2,800 lb. per cu. yd. for application on the Southern Ry.—Docket No. 52,-302.

It is proposed to establish a rate of 79 cents per gross ton of 2,240 lb., on crushed stone, carloads, from Hitchcock Mill, Va., to Alexanders, Hodges, Joliff, and Silverthorn, Va. This is in line with rates currently in effect to other destinations in the same vicinity. This is a shippers' proposal, rates being suggested by the carriers.—Docket No. 52,383.

Crushed Stone (Coated)

Shippers propose the establishment of the following rate suggested by the carriers; on crushed stone (coated with oil, tar or asphaltum), carloads, minimum weight 90 per cent of the marked capacity of the car, except that, when the car is loaded to full cubical or visible capacity, actual weight to apply, from Snow Flake, W. Va., to Reidsville, N. C., $2.30 per net ton. Made on basis of Illinois & Southern Docket 1,885 scale. Present rate, 32 cents per 100 pounds.—Docket No. 52,387.

Initiated by shipper; rates suggested by carrier. It is proposed to establish a rate on marble (crushed, ground or pulverized), carload minimum weight marked capacity of car, except that, when the car is loaded to full visible capacity, actual weight will govern, from Tate, Ga., to Good Hope, La., of $3.00 per net ton of 2,000 lb. The present rate is the New Orleans, La., combination of $5.40 per net ton.—Docket No. 52,423.

Dolomite (Roasted)

It is proposed to establish a rate on dolomite (roasted), carload minimum weight 40,000 lb., from Cincinnati, O., to East Birmingham and Fairfield, Ala., of 17 cents per 100 lb., the same as currently in effect to Birmingham, Ala. Combination rates now apply. Proposal by shipper, rates suggested by carrier.—Docket No. 52,484.

Gravel

Initiated by shipper; rate suggested by carrier. It is proposed to establish a rate on gravel, carload minimum weight 90 per cent of marked capacity of car, except that, when cars are loaded to visible capacity, actual weight will govern, from Gravelton, N. C., to Warners, N. J., of $5.30 per net ton. Made in line with carload rates on gravel from producing points in the South to destinations in the East. Lowest combination now applies.—Docket No. 52,393.

Phosphate Rock

Shippers have asked for rates on phosphate rock (ground or pulverized, acidulated and ammoniated), carload minimum weight 40,000 lb., from East Tampa, Fla., to points in Central Freight Association and Illinois Freight Association territories of 60 cents per net ton less than 12th class rates. These rates were suggested by the carriers.—Docket No. 52,307.

Sand and Gravel

Initiated by shipper; rates suggested by carriers. It is proposed to publish rates on sand and gravel, in straight or mixed carloads, minimum weight 90 per cent of the marked capacity of car, except that, when the car is loaded to full capacity, actual weight will govern, on basis of the Trunk Line Scale prescribed by the Interstate Commerce Commission in Docket 17,517, from Twohy Siding, Va., to Atlantic Coast Line and Seaboard Air Line stations in Virginia, south of Richmond and Norfolk, Va., to the Carolina line inclusive, in lieu of the present combination rates. Statement of proposed rates will be furnished upon request.—Docket No. 52,467.

Slag

It is proposed to establish rates on ground slag, carload minimum weight 80,000 lb., from Birmingham, Ala., and group to points in Southern Freight Association territory on the basis of 10 per cent of the first-class rates. Docket No. 52,499 initiated by shippers.

Status of Proposals

Some of the subjects on the Southern Freight Association docket, as reported on page 79 of October 8, PIT AND QUARRY, have been disposed of. A brief summary of the disposition of these items is given.

No. 52,125. Clay or kaolin, from Carrs and Union Point, Ga. Proposal approved.

No. 52,128. Crushed stone (coated with oil, tar or asphalt) from Snow Flake, W. Va. No final disposition.

No. 52,131. Clay from East Giles, Ala. Proposal approved.

No. 52,137. Mica (crude) from Canton, Holly Springs, Jasper and Tate, Ga. Proposal approved.

No. 52,138. Bituminous rock from Bowling Green, Ky. Final conclusions not reached.

No. 52,139. Lime from Lyle, Tenn. Final conclusions not reached.

No. 52,142. Stone (crushed or rubble) from Boxley, Va. Proposal approved.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These, interesting by comparison with practices in vogue today, are printed in this column each issue.*

▲ *Fourteen Years Ago* ▲

OBJECTION to the use of the word "sharp" in sand specifications was raised by Ernest McCullough. Concrete that was made centuries ago by the Romans is still intact. Did they require sharp sand? About one century ago an Englishman who made good concrete described his sand as sharp, and people have continued to follow his lead. The writer believed that all sand has rounded grains, that the shapes of the rounded grains have no effect on the strength of concrete, and that best results are obtained by using sand in which the grains range in size from fine to coarse.

* * *

Perhaps the word "sharp" has been retained in specifications for concrete aggregate to dispose of the notion, held by some persons, that most any pit-run sand is suitable. An editorial tells of a supervising architect who criticized a contractor for using carefully washed and graded aggregates, stating that ordinary sand, even if it did contain seven or eight per cent clay, would be sufficient—in fact, the fine material would prove beneficial in making the concrete water-tight!

Sauerman Bros. occupied the front outside cover to explain the merits of the Shearer & Mayer dragline cableway, then in its sixth successful year of operation.

* * *

▲ ▲ *Ten Years Ago* ▲ ▲

CEMENT mills in Pennsylvania reported increasing productions. Up to the middle of September, the No. 2 mill of the Atlas Portland Cement Co. at Northampton had been idle, but in November it was running at capacity. The West Coplay and the Chapman plants of the Lehigh Portland Cement Co. were being operated day and night. Some mills in the region were packing bags directly from the cement grinders to speed production.

* * *

Economy in fuel consumption was given technical discussion by F. F. Uehling who asserted that not less than 40 per cent of the heat generated in burning coal under boilers was lost in the stack gases. The greatest loss was due to excess air. In the ordinary plant from two or three times the proper volume of air is admitted to the furnace. This excess air dilutes

(Continued on page 70)

Review of Foreign Practice

Conveying Installation in Norway Interesting*

The Aktiensellskap Rjukanfos has a large limestone deposit in Norway which it operates to produce about 200 tons of crushed stone hourly for the company's own saltpeter factory and some for shipment for other purposes. The operations at the limestone deposit are noteworthy in themselves because of the location of crushing and screening equipment inside the hill of stone (fed through shafts from the excavations above), and in addition, an interesting aerial tramway system has recently been installed to carry the stone to the factory and loading plant a little over three miles distant.

Limestone is excavated from a hill about 300 ft. high, and as it was desired to take advantage of the force of gravity for moving the material and to crush the stone before conveying it to the factory, an entire crushing plant was installed in the interior of the hill, receiving stone through glory-hole shafts from two quarrying levels at the top of the hill. The equipment for this plant, including a primary and a fine-reduction crusher, roll grizzlies and screens, is located in spaces excavated specially for them, and under the screens are storage bins for both coarse and fine stone, these bins serving to feed the buckets of the aerial tramway.

The aerial tramway reaches the crushing plant through a tunnel from the foot of the hill, and that section of the tramway consists of an overhead suspension rail, led around the bins, from which the tramway buckets are supported, and the traction cable which pulls the buckets. The terminal sheave of this traction cable is supported on a skid connected with a tensioning weight which serves to keep the traction cable drawn tight all the time.

At the mouth of the tunnel the overhead monorail track gives way to a pair of track cables as in the customary tramway installations, these cables being anchored to a foundation in the tunnel. The cable that serves to carry the loaded bucket to the factory has a diameter of 1.8 in., and the other, over which the empty buckets pass on the return trip, has a diameter of 1⅛ in. These track cables are of fully closed construction with smooth outer wires and thus a flat surface which provides longer life for both the cables and the roller sheaves that support the buckets.

It was originally intended that the tramway should pass around two angle stations on the way to the factory but, as difficulties over the use of the land arose, the course was laid out in a shorter route, requiring only one change of direction and passing directly over a lake that lies between the quarry and the factory. The length of the line—17,660 ft.—made it necessary to divide it into five sections, since, with a capacity of 200 tons per hour, the buckets follow each other in fairly close succession. The angle station in the line is fully automatic, and the line terminates on the grounds of the factory at a main station where the driving machinery is located.

At this central station the tramway buckets pass to either of two secondary lines, one of which, 660 ft. long, leads over two supports to a limestone bin where the buckets are automatically discharged by means of trips so that the buckets pass around the end sheave and so back to the central station. The second line is only 300 ft. long and has a monorail rather than cable track; buckets passing over this line can be tripped either into a bin from which the stone is put into ground storage, or to a chute at the end of the line by which the stone is spouted to ships anchored at the dock. This line also is provided with automatic trips, and the buckets pass around the end sheave without uncoupling.

The drives for both the main tramway and the two auxiliary lines are located in the central station. The main line requires, on account of its length and its large capacity, an average power consumption of about 75 hp. The motor for this drive is located on the ground on its own foundation, so as not to load the station structure unduly. The much lighter motors of the two auxiliary lines, 15- and 5-hp. respectively, are located in the tower structures so as to transmit power directly to the lines.

Another section of tramway is planned to carry stone from the quarry to the Heistadt railway station nearby, so that stone shipments can be made by rail as well as water. The system that is already in operation was installed by the Bleichert company of Leipzig.

*Adapted from *Steinindustrie* 25:294-295, Sept. 4, 1930.

Names Southern Agents for Sale of Equipment

The Southern Tractor Supply Co., Durham, N. C., has been appointed exclusive representatives for the sale of Amsco manganese steel crawler tractor links and sprockets in the following territories: District of Columbia, North Carolina, South Carolina, Eastern Tennessee, Virginia, West Virginia.

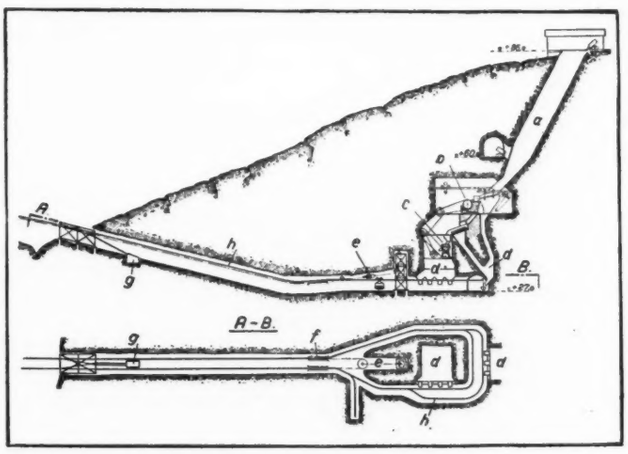


Fig. 1—(a) Glory-hole shaft, (b) Primary crusher, (c) Fine crusher, (d) Limestone bin, (e) Cable tensioning device, (f) Coupling station, (g) Track-cable anchorage, (h) Monorail suspension track.

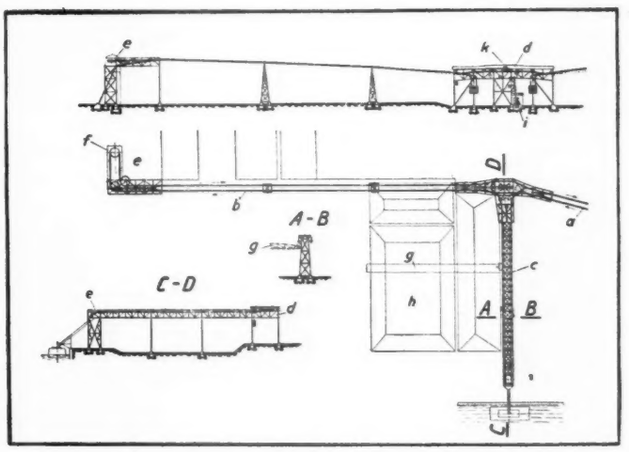


Fig. 2—(a) Main tramway from the quarry, (b) Auxiliary line to limestone bin, (c) Auxiliary line for loading ships, (d) Central station, (e) Automatic end station, (f) Stone bin, (g) Storage crane, (h) Stone storage, (i) Main tramway drive, (k) Drive for secondary lines.

Recent Patents

AMERICAN

Concrete

Concrete-mixing machine. Adolph W. Rybeck, Milwaukee, Wis., assignor to T. L. Smith Co.; same place. No. 1,779,013.

Concrete construction and method of waterproofing the same. George C. Martin, Los Angeles, Calif. No. 1,779,481.

Method reconditioning concrete after transportation. Edward N. Jones, Pittsburgh, Pa., assignor to C. O. Bartlett & Snow Co., Cleveland, Ohio. No. 1,779,708.

Apparatus for making concrete piles. Frederick W. Schwiers, Jr., New York, N. Y. No. 1,779,643.

Grinding

Tube mill. Wilhelm Jaedel, Cologne-Kalk, Germany. No. 1,780,132.

Screening

Vibrating screen. James Winston, Chuquicamata, Chile. No. 1,779,202.

FOREIGN

Blasting

Process for manufacturing explosives. W. Friederich. French 694,057.

Cement and Concrete

Process for the manufacture of cements or other similar materials. A. Anker. French 693,552.

Process for purification of fused cements. Societe d'Etudes Chimiques pour l'Industrie. German 509,593.

Process of making concrete, deaërating the cement and water before mixing the admixture with the aggregate. John Stanley Morgan. Canadian 304,906.

Crushing and Grinding

Grinding mills. A. W. McAllister. British 336,004.

Pulverizing or crushing machines. F. K. Woodroffe. British 336,021.

Integral pulverizing machine. G. Treillet. French 693,845.

Grinding apparatus. William Albert White. German 509,865.

Drive shaft seal for dry grinding mills. Hartstoff-Metall Akt.-Ges. (Hametag). German 509,801.

Grinding mill. Walther & Cie Akt.-Des. German 509,866.

Process for grinding pasty masses to semi-colloidal or colloidal fineness. Roehm & Haas. German 509,759.

Hammers for hammer mills. Fuel Efficiency Engineering Corp. German 509,210.

Spring roller mill. Ernst Curt Loesche. German 509,211.

Shaft bearing for spring roller mills. Ernst Curt Loesche. German 509,212.

Mill roller. Naamlooze Vennootschap Carbo-Union Industrie Maatschappij. German 509,213.

Device for ball mills. Friedr. Krupp Grusonwerk Akt.-Ges. German 509,214.

Grinding plant. Schnellpressenfabrik Akt.-Ges. Heidelberg. German 509,215.

Ball pusher for grinding mills. Fuller Lehigh Co. (Lester Lorrain Leach). Canadian 304,794.

Process and apparatus for comminuting materials. Allis-Chalmers Manufacturing Co. (Ray C. Newhouse). Canadian 304,934.

Crusher. Traylor Engineering & Manufacturing Co. Canadian 305,013.

Drilling

Feed screw support for rock drills. W. W. Triggs (Ingersoll-Rand Co.). British 335,592.

Process for manufacture of hollow steel for drills, for pipe and other purposes. Schoeller-Bleckmann Stahlwerke. French 694,050.

Drying

Dryers. Coe Manufacturing Co., British 314,982.

Conveyor-dryers. Dr. B. J. Owen and R. O. Davies. British 336,009.

Drying chamber with endless conveying device. Johannes E. F. Schmarje. German 509,905.

Rotary dryer. Albert Gerlach. German 509,686.

Excavating

Steering gear of excavators, cranes and other creeper track vehicles. W. D. Priestman, jun. British 335,544.

Power shovel. Unruh & Liebig Abteilung der Peniger Maschinenfabrik und Eisengiesserei Akt.-Ges. French 694,171.

Device for handling the brakes of excavating machines. Societe Anonyme Brown, Boveri & Cie. French 693,576.

Kilns

Continuous method of calcining pulverulent materials, chemicals, pigments and the like. R. Krause. British 335,659.

Tunnel kiln. Heinrich Koppers Akt.-Ges. German 509,787.

Kiln for production of fused cement. Studiengesellschaft zur Bauxiteverwertung G. m. b. H. German 510,049.

Chamber dryer directly over the annular kiln. Juliusz Janaszewski. German 510,050.

Material-handling

Conveyor belts. Bell's Asbestos & Engineering Supplies, Ltd., and T. G. Bedwell. British 335,744.

Apparatus for tipping and discharging railway cars. B. E. Ellson. British 335,776.

Dump car. J. H. Sparshatt and C. B. Dann. British 336,013.

Belt conveyor. T. G. Nyborg and M. F. Higgins. French 693,864.

Belt conveyor guide. Adolf Bleichert & Co. German 509,914.

Drive for belt conveyor. Schenck & Liebe—Harkort Akt.-Ges. German 509,122.

Device for discharging a belt conveyor. Lucien Krieger. German 509,123.

Mixing

Aggregate weighing device for concrete mixers. Koehring Co. Canadian 304,810.

Automatic control for concrete mixing machine. J. S. Withers (Koehring Co.). British 335,674.

Sacking

Automatic sacking and weighing machines. R. Jarrier. British 316,672.

Separating

Apparatus for separating solids from liquids. Woodall-Duckham (1920), Ltd., and A. M. Duckham. British 335,975.

Shaker sieves. R. Hermann, trading as firm of L. Hermann. British 316,978.

Apparatus for pneumatic separation of materials. R. H. Kirkup. British 336,055.

Separator for puverulent materials. E. S. Royer and R. J. O'Donnell. French 693,616.

Air separator. Emil Barthelmess. German, 509,216.

Miscellaneous

Process for production of porous cement insulating blocks. Torkret Ges. m. b. H. German 509,239 (addition to 468,664).

Pulverized coal burner. Zeitzer Eisengiesserei und Maschinenbau Akt.-Ges. German 509,961.

Centrifugal molding of concrete products. H. P. Amphlett, E. L. Jones and Hume Pipe & Concrete Construction Co., Ltd. British 335,517.

Synchronous motors. British Thomson-Houston Co. British 310,381.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Link Belt Co. Expands Two Branch Factories

Having recently completed a new factory at Toronto, Ont., as well as an entirely new plant to house its Pacific Division at San Francisco, Cal., the Link-Belt Co. now announces another improvement for its Indianapolis foundry. They have just closed a contract for a powdered coal system entailing an expenditure of $125,000.

This contract covers the installation of a powdered coal system at this plant, where Link-Belt chains for elevating and conveying are made. A building to house the system, and alterations in the plant, will be included in the improvements.

Legal Information for Operators

Placing Liability for Truck Driver's Injuries

Frequently discussion has arisen whether the owner of a motor-truck, or the hirer of such truck, is liable in damages for injuries to the driver, or for injuries to third parties caused by the driver. This question of the law is thoroughly considered in the recent case of Southern Surety Co. v. Shoemake, 24 S. W. (2d) 7.

The facts of this case are that the owner of a motor-truck applied to a contractor for a job hauling gravel to be used in laying the concrete foundations for a building. At that time the contractor was using gravel from several pits, hauled by different parties who owned their own trucks. The contractor told the owner of the truck that he wanted him to go to work at once, that the job would last from 10 to 15 days, and he would pay $1.50 per cubic yard for the hauling. The truck owner then built a dump bed for his own truck, with which he did the hauling, and employed and paid his own labor to load and unload his truck. The contractor told him to haul from a pit at which no one was stationed to direct or supervise the loading. No fixed amount of gravel was ever agreed upon to be hauled and no specified time was fixed in which the truck owner was to work or stop hauling, but he was paid only for gravel that was delivered by him and was accepted. In other words, the employee owned the truck with which the work was done, he did the work according to his own ideas and methods, he employed the necessary help, he worked when and as he pleased, and chose his own hours and times of labor.

One day the employee was injured when the pit, from which he was hauling gravel, caved in. He sued to recover damages for the injury. The lower court held the employee entitled to recovery, but the higher court promptly reversed this decision, saying:

"No better test can be applied than to say that the relation of master and servant exists where the master retains or exercises the power of control in directing, not merely the end sought to be accomplished by the employment of another, but as well the means and details of its accomplishment; not only what shall be done, but how it shall be done. . . . He (employee) was not under the control of Horn (contractor) in respect to the details of the work. Horn was concerned only in the gravel from the pit after it was delivered to, and accepted by, him, and agreed to pay Shoemake so much money per load only as and when delivered. The quantity to be delivered and the times of delivery were as Shoemake willed and, if no gravel was delivered, he was to receive no compensation."

Generally speaking, a sub-contractor's employee may recover compensation for an injury from the principal contractor if the latter's negligence caused the injury. However, the employee must recover solely from the sub-contractor if the injury occurred while he was performing work exclusively for the sub-contractor whose negligence resulted in the accident.

For illustration, in Rinebold v. Bray, 227 N. W. 712, it was shown that the owner of motor-trucks was employed by a contractor to haul material. An employee of the motor-truck owner was seriously injured when he was loading material on a truck. He sued the principal contractor for damages on the contention that the latter was liable because he was the employer of the motor-truck owner. However, the court held the principal contractor not liable, since he was not directing the employee how to perform his work when the injury was sustained.

Delay in Filing Lien Results in Invalidity

Various higher Courts have decided that delay in filing a mechanic's lien within the time stipulated by the state laws results in such lien being invalid. The latest higher Court case on this subject is Paxton-Pavey Co. v. Rehbaum (129 So. 346).

In this case it was shown that two material men filed suit to enforce mechanics' liens for materials furnished and used in the construction of a building. The Court promptly held the material men not entitled to the liens because they had failed to file the same within the period specified by the state law. This Court said:

"Neither Paxton-Pavey Co. nor Rehbaum, Jr., was entitled to a decree for any sum whatever, as any lien ever accruing on behalf of either of these parties had been extinguished by the running of time, inasmuch as the action for recovery here made was not filed within one year after the record of the notice of lien in either case, nor within one year after the furnishing of the last material for which the lien is claimed."

Salesman Not Entitled to Pay for Lower Rate

It is important to know that any person or firm is liable in damages for failure to fulfill the terms of a contract. On the other hand, a person who sues for damages, based upon breach of a contract, must prove that a valid contract actually existed and that he fulfilled his obligations.

For instance, in Freeman Stone & Gravel Co. v. Wight & Co. (153 S. E. 701), it was disclosed that a salesman for a stone and gravel company suggested that he might accomplish a reduction in freight rates and the stone company agreed to compensate him for doing so. The salesman interviewed the general agent of the railway company and, later, the manager of the gravel company visited the same general agent. The salesman did not proceed further with the negotiations but finally, when the rate was reduced, he sued the stone company for the agreed compensation. In holding the stone company not liable, the Court said:

"The evidence clearly shows that the project of the highway commission for the quantity and character of the material, which was in the minds of the parties at the time of the agreement, never materialized. . . . The evidence utterly fails to show that the plaintiff (salesman) was the procuring cause of the change in the rate. His efforts in that behalf had been futile and, so far as the evidence shows, had been abandoned. Nearly three months thereafter, the rate was changed by the mandate of the freight traffic manager."

Law Charging Users of Highway Declared Void

Generally speaking, any law is invalid which has irregularities, inconsistencies or contradictory terms.

For example, in Scenic v. Hay, 283 Pac. 41, it was disclosed that a state law was passed which was titled "An Act to provide restrictions as to weight and size of motor vehicles as used upon the highways of this state and providing for special permit, and declaring an emergency."

Later the law was amended to read:

"The commissioners of counties, highway districts . . . are hereby authorized, when in their judgment any traffic over roads or highways is of such a nature as may be deemed abnormal, or of a nature which will cause undue damage to the roads and highways, to require payment . . . sufficient to provide for the cost of extra maintenance made necessary by such traffic, if permitted to operate over the roads and highways."

The commissioners sued a motor-truck owner to recover payment for use of the highways. However, it is interesting to observe that the court held the law invalid, and said:

"The vesting of authority in the commissioners of highway districts to require payment for using the highways is neither embraced in the titles of the act nor properly connected therewith; the subject-matter has no relation to restrictions as to the weight and size of vehicles used on the highways."

Insurance Problems Discussed

Aircraft Damage

Yes, it has come to that!

There are so many airplanes overhead today that a special form of insurance has been devised to indemnify property owners for the damage done in case a plane should fall and land on a building.

Do not for a moment believe that this insurance was invented as a trick policy for silvery-tongued brokers to ram down their customers' throats. It is a simple indemnity for a real risk.

Take the case of the airplane that landed on a gas tank in Chicago only a few weeks ago. An experienced pilot was making a flight with two young lady passengers when something went wrong right over the heart of the big city. The plane plunged downward, tearing a hole through a big storage tank of the gas company and causing considerable property damage. Had the plane by chance landed a short distance away, where it could easily have dived through the roof of a factory, there might have been a heavy toll of lives as well.

Safety Increasing

This article is not intended as an indictment of the aviation industry. Travel by air is getting safer every day. Great strides are being taken in the direction of protecting passengers, but it is only common sense to admit that the aviation industry has not yet solved all of its problems of safety, and occasionally something will go wrong with either the plane or the pilot. The essential fact from the insurance point of view is not so much the question of frequency of accidents, but rather it is the fact that after a plane has started to crash in your direction there is nothing to do about it. A property owner on the ground cannot stop an accident in its course, but he can carry insurance.

But why not, one may ask, hang the loss on the owner of the airplane? The old common law says that if anyone damages your property he should pay you an adequate indemnity. Well, in the first place, the owner of the plane is often lying dead in the wreckage and you would have a hard time locating his estate or his assets, if any. Then, too, aviation law is a new science that is just in the making. While fundamentally it starts with the principles applying in other branches of jurisprudence, it is fast developing rules of its own and you cannot say with certainty that the owner or pilot of a plane is liable to you for damages when your only evidence is the fact that he crashed on your roof.

Who Needs It

Who should carry aircraft damage insurance? Roughly speaking, anyone should who owns property that airplanes might fly over. Property located near landing fields or in the path of regular sight-seeing routes of course should have this protection, because the rate is cheap and the risk is undeniable. Property located in out-of-the-way districts where planes are uncommon may be left uninsured, because of course it is hardly feasible to cover a very remote risk.

From the standpoint of insurance it makes little difference whether your property consists of a building, machinery, stock of merchandise, or all three. The initial damage in any case, of course, will be suffered by the roof or walls of the building itself, but on the average the contents will be damaged as much as the building.

Resulting Fires

The proper amount of this insurance to carry is a technical problem which is honestly bothering conscientious brokers and underwriters. As far as direct damage is concerned, the falling of an airplane will not cause a total loss to a well-constructed building or its contents. A plane might tear things up considerably, but it would still leave part of the building standing. The worst angle of the situation seems to result from the possibility that, after striking the building, an airplane might catch fire and burn the property to the ground. This involves a feature of insurance which our readers have already met in connection with windstorm and earthquake insurance. That is, the standard fire insurance policy becomes void as soon as an airplane (or anything else) wrecks a portion of the insured building. The resulting fire damage must therefore be covered by an aircraft damage policy since the fire policy is automatically void.

The amount of insurance to carry will depend on your attitude toward this possible consequential fire loss. If you want to cover the direct damage resulting from a falling plane you need insure only a small fraction of the value of your property. But if you want to include the fire coverage you will have to carry aircraft damage insurance roughly equal to your fire insurance.

Auto Damage

In form of policy the aircraft insurance is a double coverage at a single price. It includes not only damage done to the insured building by falling aircraft but also damage done by motor vehicles. The aircraft risk is so much more spectacular and so much more universal that the full scope of the policy is sometimes submerged in the abbreviated name of aircraft insurance.

In some cases the addition of damage from motor vehicles is a very attractive feature of this new contract. The writer has had clients who suffered the following typical losses:

(1) The home of one of his friends was crashed into at night by a drunk who was driving his car wildly down a suburban street. Although the driver was clearly to blame this man never collected a cent for the damage done because the driver had no assets and was judgment proof.

(2) A heavy truck backed into an iron column which formed a principal support of a warehouse building. The entire building was weakened by having this post knocked out, and the structural damage was surprisingly expensive.

(3) Another truck skidded through a first-story window, wrecking the brick work and window frame, and crushing the records in some filing cabinets in the plant office.

These represent the types of loss which might be covered under the new combination policy and will help you to picture to yourself whether the risks in your own case demand a more thorough investigation.

Pumpings

(*Continued from page 66*)

the gases of combustion and lowers their effective temperatures. Mr. Uehling declared that the loss of unconsumed carbon as smoke or soot had been greatly overestimated, the average loss from this source being less than 2 per cent.

* * *

The Allis-Chalmers Mfg. Co. advertised the ruggedness of its crushing machinery which was used in every part of the world.

▲ ▲ *Five Years Ago* ▲ ▲

IN the concluding installment of an article about retarders for Portland cement, Ernest E. Berger of the U. S. Bureau of Mines analyzed the effects of different retarders on the consistency and plasticity of cement mortar, and the effects of different forms of calcium sulphate on the setting time. Numerous graphs and tables presented data upon these subjects. One conclusion was that plaster of Paris is the form of sulphate which is most active in the setting effect, while anhydrite has practically no effect.

* * *

The Smith Engineering Works had just moved into its new plant at 78 Lake Blvd., Milwaukee, Wis.

* * *

A new office had been opened in Portland, Ore., by the Marion Steam Shovel Co. with Z. A. Toye and H. J. Armstrong in charge.

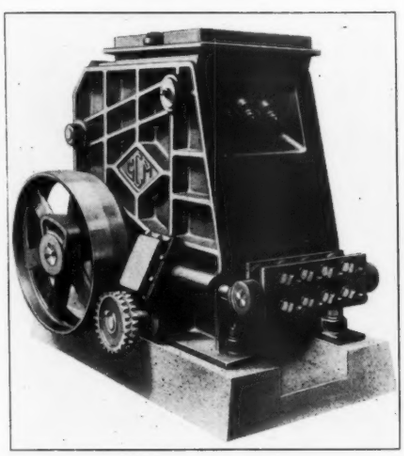
New Machinery and Supplies

Yielding-Jaw Crusher of Interesting Design

One of the most radical improvements made in jaw crushers for the past fifty years is embodied in the new GCM yielding jaw rock and ore crusher now being manufactured by the Guest Crushing Machines, Inc., at Los Angeles, Cal. This new crusher is the result of many years of experimental and development work on the part of William W. Guest who has, for the past forty years, been occupied with the developing, designing and operating of mine equipment.

During the past five years Mr. Guest has devoted his entire time to supervising the manufacture of the most advanced types of rock and ore crushers which have been successfully marketed.

The crusher incorporates the yielding-jaw principle and utilizes roller bearings throughout. The crushing action, after material is reduced to size, is downward for ⅛ of each revolution, serving to give the added impetus over the action of a free-falling body. The machine may be used as a primary and secondary crusher or as either. The 6-in. by 16-in. size illustrated will handle nine tons of rock per hour when set at ¼ in. This takes into consideration a maximum feed of 6-in. materials, delivering a uniform crushed product of 5/16-in. size. The ratio of reduction in this particular case is 19 to 1.



New crusher incorporating yielding-jaw principle.

Outstanding features include a breakable shear pin which prevents throwing the motor shaft out of alignment in case foreign material becomes lodged in the crusher jaws. Provision is also made for instant release of this foreign matter without the necessity of explosives or expensive dismantling. All working parts are readily accessible, while the size adjustment of the finished product can be accomplished while the machine is operating.

The bearings used are the Norma Hoffmann roller type with positive oil and dust seal.

The unit comprising the fly-wheel pulleys, shaft and bearings is precision balanced before assembling in crusher, so that there is a minimum of vibration and a reduction in horsepower. The manganese jaw plates may be easily removed without dismantling crusher. The eccentric jaw plate is reversible.

Care has been exercised in the design and manufacture of the crusher to enable it to respond readily under actual operating conditions. The crushing action is such as to accelerate the passage of sticky material that would ordinarily "ball up" in any other type of crusher.

The installation and operation of the crusher is supervised by field experts maintained for this particular type of work.

A new catalogue will gladly be mailed if the Guest Crushing Machines, Inc., 107 Annandale Blvd., Los Angeles, is addressed.

Crawler Track for Use on Industrial Tractors

The Moon Track Co., with offices in the McCormick Bldg., Chicago, announces a semi-crawler track for McCormick-Deering industrial tractors, both the Model 20 and Model 30. These tracks are invaluable in dirt moving and other work where traction is one of the chief items.

Moon tracks advance over all obstructions without discomfort to the driver. Steering is easily controlled through the regular steering mechanism, including the two front wheels; thus, the tractor is of the four-point, ground-contact type. These features combine the efficiency, comfort, and control of the round-wheel tractor with the advantages of the crawler type in adverse working conditions.

These tractors portray a new feature in track construction. The driving pinions are in the center of the track, operating on both the top and the bottom of the track regardless of its position. The pinions are of manganese steel, and will withstand almost unlimited wear.

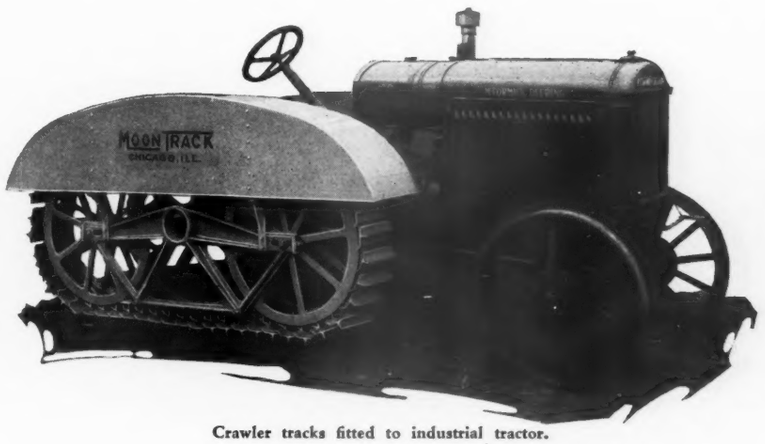
Another feature is that the shoes are self-cleaning. They are held together at one point only by a special bolted pin. This single shoe pin permits the shoes to open and close twice in every travel around the track. This opening and closing cleans the tracks of mud, clay, ice, or any other material over which they are traveling. Two types of shoes are available, either smooth tread for road work or sharp tread for loose ground work. Cleats can be supplied for the round tread. The shoes are reversible, thus doubling their life.

These tracks are quickly interchangeable with the wheels, the change being accomplished in about an hour's time. It is merely necessary to remove the rear wheels and fit the tracks on the axle; thus, in cases where speed supersedes the factor of traction, the wheels can be used and little time is lost in making the change. Moon tracks fit on present McCormick-Deerings, and are being supplied with new tractors.

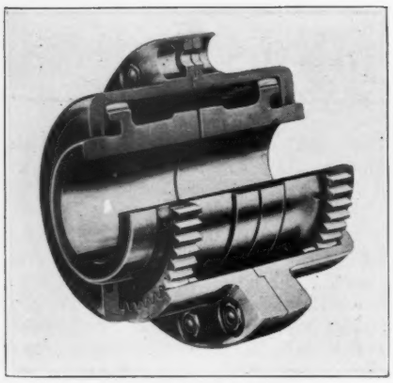
New Flexible Coupling for Light-Duty Service

A new model flexible coupling of the medium-duty type has just been announced by the Poole Engineering & Machine Co., Baltimore, Md.

Both sleeves and hubs are machined from solid bars of high-grade, high-carbon steel. Sleeve members and end plates are integral. It is fully lubricated, oil-tight, dust and moisture proof.



Crawler tracks fitted to industrial tractor.



Medium-duty type of flexible coupling.

Construction is of the geared type, providing the highest efficiency of modern flexible coupling design, having no flexing materials to crystallize or break. The coupling adjusts itself to all conditions, leaving its members free to float without causing strain to bearings, shafts, or any other parts. It will compensate for angular as well as offset misalignment efficiently. It is supplied with either counter-sunk or through bolts.

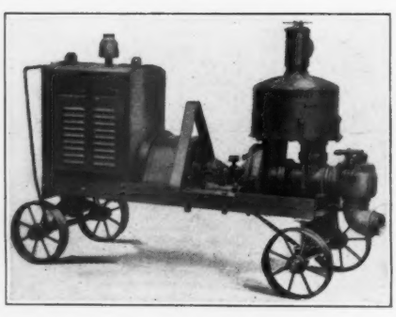
Due to the popularity of standard Poole flexible couplings, the company has frequently been called upon to supply a less expensive model for light- and medium-duty service. The new medium-duty type has been designed to meet these requirements and will be found particularly adaptable to drives of pumps, fans, small compressors, small generators, blowers, conveyors, elevators, and in fact all types of light- or medium-duty machinery.

New Self-Priming Pump of Simplified Design

A new self-priming centrifugal pump has been placed on the market by Marlow Pumps, of Ridgewood, N. J., in sizes from 2½ in. to 6 in. inclusive. The principal features of the pump are said to be:

1. Simplicity. In addition to the shaft and impeller of the standard centrifugal pump, there is only one moving part, and if that part were taken out, the pump would still function, but at a reduced capacity.

2. Open impeller only is used, to permit passage of solids and gritty water.



Portable self-priming centrifugal pump.

3. The simplicity of the pump makes it extremely simple to maintain in operation; if trash or weeds should clog the pump, a handhole plate may be opened and the trash removed, without stopping the pump.

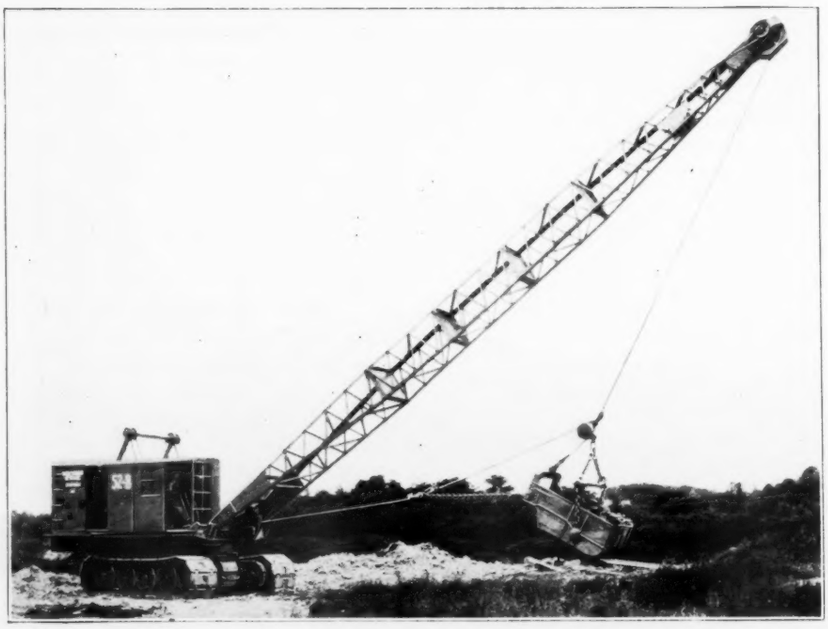
4. A plain steel tank, placed over the centrifugal pump, holds water for the initial and succeeding primes.

5. After picking up its prime, and while pumping a full volume of water, the pump operates as a straight centrifugal. The self-priming part only comes into operation when air is taken into the suction line, and as soon as that air is ejected, the pump again becomes a straight centrifugal.

6. Units are supplied with either engine or electric motor drive.

Combination Excavator Called "Fastest Ever"

Recently introduced by Bucyrus-Erie Co., South Milwaukee, Wis., is the new 52-B Diesel shovel, dragline, clamshell, crane, which it claims to be "the fastest 2¼-cu. yd. Diesel ever built."



Diesel-operated machine working as a dragline.

Particularly welcomed by dragline men are the new extra long and extra wide crawler-type mountings provided instead of regular mountings when low ground-bearing pressure is required. Complete steering control from the operator's position and independent propelling permitting swinging, hoisting and propelling at the same time, are additional features for easier and faster mobility. The power plant is an Atlas-Bucyrus-Erie improved, four-cycle, six-cylinder, solid-injection, full Diesel giving great fuel economy with the Diesel's unique characteristics of increasing lugging power under a load.

The new machine conforms to the latest standards of mechanical perfection, having all high-speed shafts mounted on ball or roller bearings, transmission and swing reversing gears and all gears below deck inclosed and running in oil, rugged unit steel-casting construction, and many other refinements in design. The machine is built for shipment on a flat car without removing the revolving frame and cab from the base.

After several months spent in installing machinery, the new crushed-stone plant of the Moorpark Cement Pipe & Construction Co. of Moorpark, Cal., has begun operating. The plant, located in the Simi Valley near the town, is producing rock at the rate of 125 tons per day at present, according to Charles F. Hunt, manager.

Machine to Test Welds for Shop or Field Use

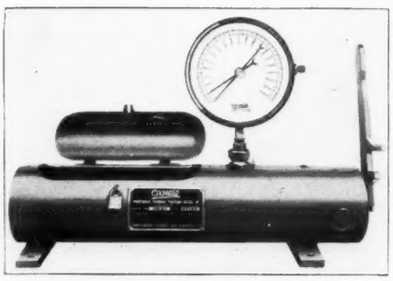
Oxweld Acetylene Co., New York, announces the Oxweld portable tensile testing machine, designed to facilitate the testing of welds in the field or shop. This machine was developed in coöperation with Union Carbide & Carbon Research Laboratories, Inc., and, having successfully passed service tests over a period of time, is now being sold as a standard piece of Oxweld equipment.

This machine weighs 165 lb. and measures 28 in. in overall length and 6¾ in. in maximum diameter. It is a self-contained, totally enclosed unit. When closed for shipment, there are no projections and the machine presents a comparatively smooth cylindrical surface. The accompanying illustration shows how the machine appears when open and ready for making tensile tests.

The machine consists of a tubular compression member with a set of grips in the head and a hydraulic

cylinder block in its base. The cylinder block contains a communicating pump and cylinder directly machined into a single block, and the cylinder pressure operates a piston carrying a second set of grips.

The specimen to be tested is placed between the jaws, which have spring grips. The release valve is closed and the pump handle, applied at the end of the cylinder, is moved back and forth. A set of conical blocks has also been constructed to fit into the machine head in place of the grips so that the standard ½-in.-diameter round specimens may be tested if desired. The



Machine for testing strength of welds.

load is measured directly in pounds per square inch by a suitable, calibrated pressure gauge actuated by the pressure in the cylinder. The gauge is one of the essential parts of the apparatus. When a test is finished, the pressure may be released by a valve and the piston may be returned to its original position by using the pump handle as a lever.

This machine makes it possible to secure a tensile-test result immediately after welds are made. This is particularly important in connection with qualification tests for determining welders' ability. It also facilitates making periodic check tests of the operators and in many cases provides a ready means for testing sections cut at random by the inspector from completed work.

The value of this machine in overland and public-utility pipe-line construction is inestimable not only because periodic tests are required in welding under procedure control, but also because portability of the machine is an important factor. Industrial and power-plant piping contractors and all industries employing welding as a production method will find this machine of service as an aid in maintaining procedure-control standards.

Reinforcement Casting Made for Dipper Doors

The American Manganese Steel Co., Chicago Heights, Ill., has recently placed before the trade a new type of dipper-door reinforcement casting, called the Meyer turtle-back.

This casting, made of Amsco manganese steel, can be applied to any dipper door that is flat inside and that has not become distorted. The turtle-back, on which patent has been applied for, is convex to the work, and of ample size and strength to protect the

Turtle-back reinforcement for dipper doors.

door and mechanism from severe shock and distortion.

The turtle-back is designed to reduce wear and eliminate the bothersome door and latch troubles caused by falling rocks, the shock from which permanently distorts door sheets.

It is made to suit all dipper sizes, and is quickly and easily secured to the inside of the door so as not to interfere with door braces and latch mechanisms.

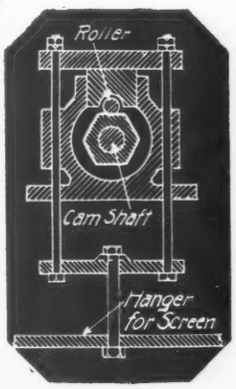
New Vibrating Screen Hangs from Cam Roller

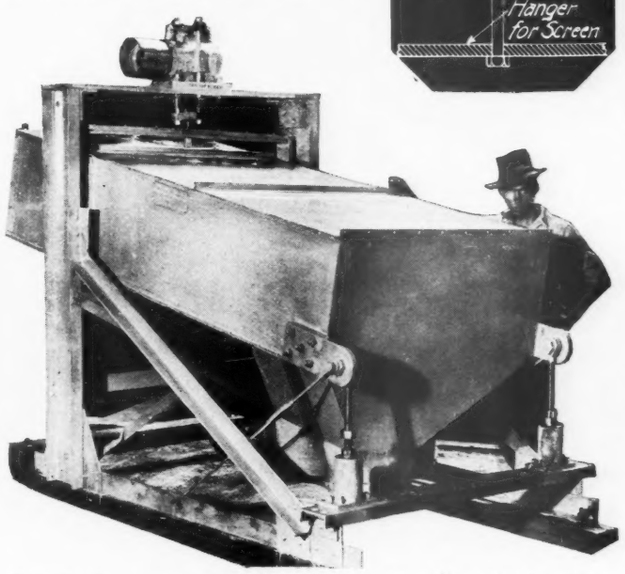
For years the Williams Patent Crusher and Pulverizer Co., St. Louis, Mo., has specialized entirely in crushing and grinding machinery and has seldom departed from that field. However, the work of its new Kam-Tap vibrating screen has been so impressive during its months of development and use that the firm feels amply justified in adding it to its line.

This new screen has many uses in the quarry industries. It can be used as a single-deck scalper or in the three-deck type can be employed as the main separating unit. In the latter work the Kam-Tap will make accurate separation and will deliver unusually clean binder rock free from fines. In screening silica sand, asphalt filler, talc and for other fine work the Kam-Tap is said to have no equal. Gravel producers can use the screen to advantage for removing oversize gravel and for intermediate separations of sized gravel.

As will be noted in the illustration, the entire screen frame hangs from the cam roller which, as it rides over the cam points at high speed, causes the vibration and the motion which shakes out the fines and keeps oversize material from blocking the screen openings. Cams with 4 to 8 points are available and are interchangeable and by increasing or decreasing the number of cam points and by regulation of the cam-shaft speed, vibration is adjusted as regards vibrations per minute, range of rise and fall, and violence or speed with which the screen is raised and lowered. Cams operate in an oil bath and have a long life as the cam roller passes over the cam points with a rolling rather than rubbing motion.

The screens are built in ten popular sizes and with one, two or three decks.





New vibrating screen particularly adapted to sizing fine materials. Upper right—Details of the vibrating mechanism.

Keeps Smooth Starting Feature on New Clutch

The new Hill-Pulvis line of clutch-pulleys and clutch-couplings now being placed on the market by The Hill-Clutch Machine and Foundry Co., Cleveland, Ohio, offers unusual advantages in the starting and handling of heavy loads. They are entirely automatic both in pick-up and in release, and thus keep the load on the motor, gasoline engine or other driving unit within adjustable predetermined limits.

Because of these features, the Hill-Pulvis clutch is particularly recommended for direct-connected or belt drives operated by electric motors. Not only can the regular type of motors be used instead of the more costly slip-ring or high-torque types, but also in many cases a decidedly smaller motor and less expensive switchgear are required. In belt drives the saving through the use of lighter belting is an important item.

The operating

principle of the clutch is simple and unique. There are two main parts—an inner rotor carrying impeller blades having orifices at the points where they are attached to the shaft; and an outer shell with serrations set lengthwise all around its inner face. The clearance between the impeller blades and the serrated shell-surface is very small. A certain definite quantity of chilled steel shot is placed in the shell, and the two ends of the clutch are closed by dustproof snap-ring holding plates. The impeller portion is connected to the drive side of the clutch, and the outer shell to the machine to be driven.

When the clutch is at rest, the chilled shot lie at the bottom of the shell. On starting the motor, the impeller blades revolve, driving the shot before them over the serrated surface. Part of the shot escape through the impeller orifices, and part are thrown outwards against the serrations by centrifugal force. As the motor speed increases, however, more and more shot are forced outwards, thus gradually increasing the clutch action. Finally, when the motor has attained full speed, all the shot are tightly packed ahead of the impeller blades and transmit the full power to the driven element of the clutch.

In the event of an overloading of the driven machine, its speed decreases. This at once causes the packed shot to slip until safe balance is reached. Thus the load on the motor can never exceed that for which the clutch has been set. The slipping point is determined by the size of the charge of shot within the clutch, and may be set with great accuracy. A telltale spring cam engaging with pins on the outside of the impeller unit affords an audible clicking signal which ceases as soon as the clutch is up to speed.

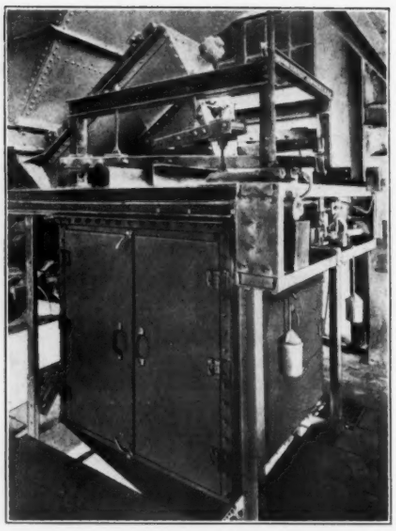
Auto-Weigher Assures Correct Proportioning

The new Richardson weigher illustrated is of the automatic hopper-dumping and self-registering type. Automatic conveyor-type scales are available where conditions dictate this style.

The bad effects of a "flood" from the bin are eliminated by the double-screw feeder which is an integral part of the scale. By double-screw feeder we mean there are two conveyors—one a large one to feed the main part of each weighing and a small one to feed the final "make weight."

The main screw conveyor is of ample size and speed for quick feeding. Being inclined at a considerable angle from the horizontal this conveyor takes the "run" out of the cement and delivers it quietly and under control through a dustproof chute into the weighing hopper which is also enclosed in a dustproof housing having suitable access doors.

The main screw feeder is driven by motor through an enclosed worm



Automatic scales below storage bin in a large cement plant.

speed reducer which in turn drives a pair of heavy cast bevel gears that drive the conveyor through a slip clutch.

When the main screw feeder has delivered approximately 90 per cent of the individual weighing or batch, it is stopped by the action of an electric switch in the control box. The small auxiliary screw is mounted immediately underneath the main feeder and feeds in what is known as the "dribble stream" or final small flow necessary for accuracy. This smaller screw is driven by its own speed reducer, motor and gearing for it continues to run after the main screw has stopped, the dribble screw in turn being stopped automatically when the exact weight of cement has been delivered to the scale weighing hopper. Both the main screw and the dribble screw are enclosed in their own dustproof tube casing.

The scale is of standard construction with hanging weights for part of the load and a weigh beam with sliding weight for the remainder at one end of the system and the weigh hopper for the cement is suspended at four points at the other end. Weights are placed on the weight carrier and the poise is set for any predetermined weight within the range of the scale.

Directly the correct given weight has entered the hopper, the feeder is stopped entirely by an electric switch breaking the circuit to the driving motor of the dribble screw feeder, the main feeder by this time being at rest. Accordingly, no more cement enters the scale hopper, the weigh beam balances and the accuracy of the weighing can be verified by a glance at the weigh beam swinging in the trig loop, which beam is outside the hopper housing in a beam box at the front.

The cutoff is positive—entirely automatic and dustless. The accuracy of the weighing is beyond dispute.

When used for the intermittent service of loading a mixer or truck, each weighing is discharged by pulling a hand chain which opens the weigh hopper door when a signal light indicates that the feeder has completed a weighing.

To commence the next weighing a push button starter is provided to start the motors driving the main and dribble screw feeders. A stop button is also provided.

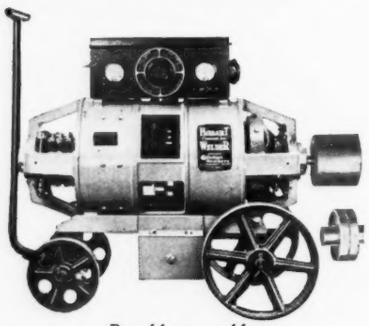
The motor and electrical equipment are protected by a magnetic starter and overload relay.

The weigher is manufactured by the Richardson Scale Co., Clifton, N. J.

Single Dial Simplifies Arc-Welder's Operation

A new portable arc-welding machine, known as the "constant arc" welder, has been placed on the market by Hobart Bros., Troy, O.

The machine, illustrated here, is equipped with a unit-control dial which tells the operator what size



Portable arc welder.

electrode and the current setting to use on any job, making welding easy for beginners.

Large brush holders, oversize brushes and an unusually large commutator assure long life, sparkless commutation and trouble-free operation. The machine is silent running, ball bearings being used throughout the main shaft. Lubrication is required only once every six months.

Rotors and pole pieces are of steel laminated construction assuring excellent magnetic qualities.

In addition to the mounting illustrated, the welder may be obtained on pneumatic-tired wheels, fully enclosed for road work. Gasoline-engine drive is optional and the company can supply the machine with belt or coupling for power from a line shaft if desired. The outfit is reasonable in cost and will pay for itself, by reducing plant-maintenance costs, in a short time.

Los Angeles Firm Named Agent for Welding Co.

Eccles & Davies Machinery Co., Inc., Los Angeles, has been appointed agents for the Hollup Corp., Chicago, Ill., manufacturers of welders and welding rods. Stocks will be moved from the East in carload lots to California for the purpose of lowering shipping cost to buyers.

Manufacturers' Publications

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Bearings

Common Sense About Bearings. 36 p., 6 ill. (Universal Bearing Metals Corp., Rochester, N. Y.) Describes and illustrates the composition, characteristics and application of a bearing metal known as "bearium," a copper-tin-lead alloy.

Chain

Drive and Conveying Chain. 90 p. Illustrated. (Catalogue No. 100. Union Chain & Mfg. Co., Sandusky, O.) A treatise on drive and conveying chain, including engineering data. Sprocket wheels are also discussed.

Link-Belt Promal Chains. 32 p. Illustrated. (Book No. 1050. Link-Belt Co., Chicago, Ill.) Describes and illustrates the standard types of transmission chain made of a new metal of high tensile strength and wear resistance.

Crushers, Roll

Turning a Waste Product Into Profit. 4 p., 6 ill. (Rogers Iron Works, Joplin, Mo.) Describes and illustrates the use of high-speed crushing rolls for producing fine aggregates from waste pea gravel.

Electrical Equipment

A New 2,300 Volt Motor Starter. 4 p., 10 ill. (The Electric Controller & Mfg. Co., Cleveland, O.) Describes and illustrates a completely-wired, self-contained, full-voltage starter for squirrel-cage and synchronous motors, and for the primary control of slip-ring motors.

Excavators

Bucyrus-Erie 1020. 20 p., 31 ill. (Bucyrus-Erie Co., South Milwaukee, Wis.) Describes and illustrates the 1020, a ½-cu. yd. convertible clamshell, crane, shovel, dragline and drag shovel —the smallest of the Bucyrus-Erie line which may be had with gasoline, Diesel or electric power plants.

Lubrication

Alemite Industrial Lubrication. 8 p., 12 ill. (Vol. 4, No. 5. Alemite Corp., Chicago, Ill.) Describes and illustrates the pressure lubrication of machines through special fittings supplied by this concern.

Manometers

The Manometer and Its Uses. 48 p., 20 ill. (The Meriam Co., Cleveland, O.) An interesting and instructive pocket-size manual describing and illustrating the operation and use of the U-type manometer. Written by J. B. Meriam.

Miscellaneous

The American Sectional Exhibit Rack. 6 p., 4 ill. (Hamilton Mfg. Co., Two Rivers, Wis.) Describes and illustrates a portable rack forming a booth for exhibition or convention purposes.

Motors

Direct-Current Crane and Hoist Motors. 4 p., 8 ill. (Bulletin 38B. General Electric Co., Schenectady, N. Y.) Describes and illustrates a compact, series-wound, fully-inclosed motor especially designed for crane and hoist duty.

Unit Type Ideal Induction Motors. 8 p., 20 ill. (Bulletin 200. The Ideal Electric & Mfg. Co., Mansfield, O.) Describes and illustrates a line of induction motors with numerous features of improved design.

Pumps, Centrifugal

Marl-O-Pumps. 4 p., 4 ill. (Bulletin 70. Marlow Pumps, Ridgewood, N. J.) Describes and illustrates a portable centrifugal pump which primes automatically on lifts up to 26 feet. Sizes and specifications are also included.

Safety Appliances

Industrial Eye Protection. 36 p. Illustrated. (American Optical Co., New York, N. Y.) Describes and illustrates a wide variety of goggles, masks and hoods for protecting the eyes of workmen.

Standard Safety Equipment. 72 p. Illustrated. (General Catalogue No. 4 Standard Safety Equipment Co., Chicago, Ill.) Describes and illustrates safety devices for the plant, including helmets, gloves, goggles, guards, warning signs and first-aid materials.

Scrapers

"Power Scraper—Feeds Gravel to Industrial Railway Cars." 3 p., 3 ill. (*Sauerman News* for October, 1930. Sauerman Bros., Inc., Chicago, Ill.) Describes and illustrates how a Missouri sand-and-gravel producer uses a scraper and car combination to extend his pit operations.

Shovels

The Line That Leads. 8 p. (The Marion Steam Shovel Co., Marion, O.) Tells, in an interesting manner, the story of a visit to the plant of this company.

Stokers

Type E Stoker. 28 p., 43 ill. (Combustion Engineering Corp., New York, N. Y.) Describes and illustrates an underfeed stoker recommended for burning either coking or non-coking bituminous coals and for various refuse fuels. Includes line drawings showing suggested applications to various types of boilers, a list of representative installations and test data.

New Corporations

WYCKOFF SAND & GRAVEL CO., Wyckoff, N. J. E. P. Appert, president; F. W. Frank, treasurer; E. Smith, vice-president, secretary, $125,000.

SAND MAN, INC., Cranston, R. I. 100 shares n.p.v.

SOUND GRAVEL CO., c/o Goodwin-Gallagher Sand & Gravel Corp., 21 E. 40th St., New York, N. Y. Leathem D. Smith, president, Sturgeon Bay, Wis.; Frank J. Gallagher, vice-president; John Gallagher, treasurer; T. A. Sanderson, secretary. 5,000 shares n.p.v. Will operate steamer *Bay State,* dredging gravel in Long Island sound and delivering it in New York.

AIR CITY GRAVEL CO., c/o Jacob Iler, 506 Kirkham St., Dayton, Ohio. E. W. Campbell. 200 shares n.p.v.

R. NEWTON MCDOWELL, INC., 912 Midland Bldg., Kansas City, Mo. R. Newton McDowell. To operate rip-rap quarries on Missouri river, and portable plants to produce stone for Missouri State Highway Dept.

RAINBOW QUARRIES CORP., 3700 Rainbow Blvd., Kansas City, Kans. R. Newton McDowell, L. E. Miller, M. L. Morrow, Kansas City, Mo.; Samuel Burton, Reuel G. Thompkins, Charles C. Thompkins, Kansas City, Kan.

AVERY MINING CO., INC., 304 Cotton States Bldg., Nashville, Tenn. H. H. Sanders, general manager; F. J. Miller, president, $50,000. Feldspar and mica mines at Plumtree, N. C.

COLUMBIA SAND & GRAVEL CO., 74 Holly St., Columbia, S. C. W. S. Gardner.

STANDARD ROCK ASPHALT CO., Nevada, Mo. B. H. Cubbage, Chanute, Kan.; George S. McLaughlin, Deerfield, Mo.

C. BYNUM CLEGG CO., 615 Fulton St., Greensboro, N. C. C. B. Clegg, president and treasurer. $100,000. To produce sand, gravel and crushed stone.

WESTERLY GRANITE CO., INC., Westerly, R. I. Frank A. Sullivan, president and treasurer; John B. Sullivan, Jr., vice-president, secretary. 100 shares n.p.v. To produce crushed pink granite.

MISSOURI ROCK ASPHALT CO., 1003 Scarritt Bldg., Kansas City, Mo. William Hicks, Samuel Feller, A. R. Brown, E. J. Feller. $50,000.

DETROIT SLAG & ROCK CO., 1917 Penobscot Bldg., Detroit, Mich. Trent McMath, Benjamin H. Long. Branch of Lake Ports Supply Co. $400,000.

Aërial Tramway Grows in Popularity as Economical Means of Transport

For years the Interstate Equipment Corp. has been offering a terminal-discharge type of aërial tramway as a low-cost haulage unit in the transportation of bulk materials from one fixed point to another. Aërial tramways of various types have been developed to a high degree of efficiency in Europe, and have been in general use particularly in the mountain districts of Europe for the handling of miscellaneous freight, and to a lesser degree for passenger transportation for generations; while in this country aërial tramways have been used principally in the mining districts and then only under most trying conditions. Indeed, they have been more or less considered as a "last resort" when and where other transportation methods were not feasible.

The seeming incongruity of this circumstance appears not to have impressed itself upon the minds of the engineers and operators of the various fields until of recent years when the sheer weight of performance under the most trying circumstances focused the attention of those interested in lowering haulage costs upon aerial tramways and has brought about their more general use in other fields. To-day aërial tramways are recognized in all industries, competing favorably with surface haulage systems on comparatively long hauls, and with such old favorites as belt-conveyor systems and electric-mule haulages for comparatively short hauls.

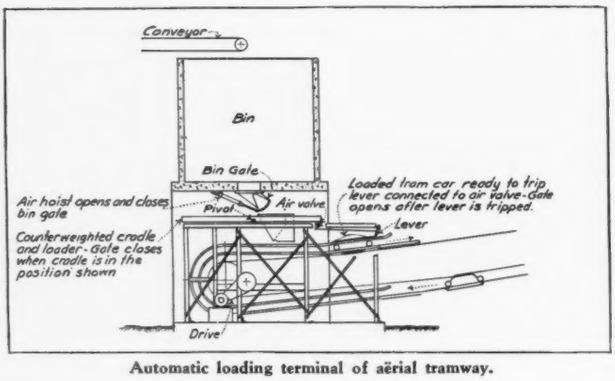
To keep pace with the general demand for the elimination of labor in all material-handling devices, the Interstate Equipment Corp. has developed and improved its tramways by adding an automatic loading feature, which entirely eliminates labor in the operation of these tramways. Among the notable installations of this type is the tramway that handles crushed limestone and zinc ore at Mascot, Tenn., for the American Zinc Co. This tramway is approximately 2,200 ft. long, and crosses a county road, a two-track mainline railroad system, and a creek. It not only acts as a transportation medium, but elevates the crushed rock approximately 200 ft. above the bins at the loading end, thus accomplishing in one operation the movement of the crushed rock and the elevation of the rock to the storage bins at the plant. This tramway is operated six days of the week, frequently for fourteen and sixteen hours per day, and handles approximately 50,000 tons of crushed rock per month.

In this operation the limerock is mined rather than quarried and is hoisted in a two-way balanced-skip hoist several hundred feet to bring the rock to the surface. Here the skip cars discharge their loads into a giant gyratory rock crusher. A secondary crusher reduces the rock to ¾-in. size. From this crusher the stone is conveyed to a concrete silo of approximately 200 tons capacity. This silo is 18 ft. in diameter and is set upon a concrete base built over the tramway loading terminal.

This type of Interstate tramway features a number of 4-wheeled cars operating over parallel cables supported at intervals by towers in the same manner as a car travels along fixed rails on the ground. The cars (of any given capacity) are spaced at fixed intervals and are firmly attached to an endless traction rope which passes around a drive pulley at one end of the tramway and an idler pulley at the other end. The terminal pulleys, instead of being in a horizontal plane, are set in a vertical plane so that the cars pass through a vertical half circle at each end, making an endless loop on which the loaded cars travel on the top track and the returning empty cars travel bottom side up on the lower track.

At the loading terminal the cable rails pass over fixed saddles to anchorages. The continuation of the cable rails which form the terminal loop tracks are of standard T-rails, the same construction obtaining at the discharge terminal.

The mechanical loading of the cars is accomplished by means of a batch loader which is set in a pivoted cradle counter-weighted at one end to balance the weight of stone that will fill one tramway car. This loader is set immediately over the tramway track rails and under an undercut bingate, which is fastened to the bottom of the concrete storage silo. The gate is operated by a powerful two-way air hoist and controlled by the movement of the tramcars through the terminal. The tramway itself is driven by a 25-hp. slip-ring motor, through a rex-rope drive and spur gearing direct to the main shaft of the tramway. The only human element in the operation of the system is to press the starting button actuating this motor. From this point on the tramway performs all functions of itself.


Conveyor
Bin
Bin Gate
Air hoist opens and closes bin gate
Pivot
Air valve
Loaded tram car ready to trip lever connected to air valve-Gate opens after lever is tripped.
Lever
Counterweighted cradle and loader-Gate closes when cradle is in the position shown
Drive

Automatic loading terminal of aërial tramway.

The first car passing through the loading terminal receives no load, but as it leaves the terminal, it strikes a lever controlling a two-way air valve which causes the air hoist to open the undercut gate, permitting crushed rock to slide from the storage silo into the counterweighted batch loader. When this loader receives sufficient material to balance the counterweight, it settles to a horizontal position and automatically throws the two-way air valve to the opposite position, actuating the air hoist to close the bingate, thus cutting off the flow of material to the batch loader. The loader then remains charged until the next tramway car passing through the terminal trips the latches releasing the loader door, and the contents of the loader slide into the passing tramway car. The whole operation of opening the bingate, filling the counter-weighted batch loader, and transferring the load to a tramway car, requires but five seconds. The cars pass through the loading terminal, however, at intervals of approximately 16 seconds, so that it is apparent that the actual capacity of this tramway could be increased simply by adding tramcars.

Protection devices to guard against the possibility of accidents, through the failure of any of the component parts of the loading system, are provided, making the arrangement positive and practically accident-proof. In a year's operation, there have been no shut-downs of any description.

These tramways may be constructed to suit any ground conditions and practically of any length. The elimination of labor has reduced the operating cost to the cost of power, oils, and grease. All running sheaves and car wheels on this tramway are equipped with Timken roller bearings and Alemite fittings.

At the discharge terminal, the cars release their loads as they pass downward through the vertical loop. The discharge terminal is set over a bin of approximately 1,000-tons capacity.

Work Under Way on New Burton Explosives Plant

Work is under way at New Castle, Pa., on the new explosives plant of Burton Explosives, Ltd. The plant, which occupies a 400-acre site formerly held by the Du Pont interests, will be able to produce 18 million pounds of explosives annually, according to reports.

J. S. Burton, formerly head of the Burton Powder Co., and at one time connected in an executive capacity with the Grasselli Powder Co. and the American High Explosives Co., is president of the concern.

Operating Costs for Dry Grinding Limestone Mix in Closed Circuit with Air Classifier

These costs are based on ½" and finer feed of average Limestone Mix, ground to a fineness of 90% minus 200 mesh, at a capacity of 25 tons per hour in a 10-ft. Hardinge Mill in a Western cement plant.

Operating Cost Per Ton

Gear, Pinion and Fan Renewals	$0.0038
Lining	0.0037
Balls	0.0036
Labor (1 man @ $5 per shift, 3 shifts)	0.0250
Oil, grease and miscellaneous	0.0100
	$0.0461

Taking 3.3 barrels per ton of raw, this gives you a cost of less than 1.5c per barrel. The total power consumption, including mill and classifier exhauster, is 15.2 KWH per ton.

Write for further information

HARDINGE COMPANY
YORK, PENNSYLVANIA
WORKS AND MAIN OFFICE YORK, PENNA.
BRANCH OFFICES
NEW YORK, N.Y., 122 EAST 42nd STREET
SALT LAKE CITY UTAH: CONTINENTAL BANK BLDG.
CABLE ADDRESS "HARDINGHEL NEW YORK"

Hardinge

Conical Ball, Pebble and Rod Mills, Ruggles-Coles Dryers, Thickeners, Clarifiers, and Sand Filters

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXI December 3, 1930 No. 5

In This Issue

Redesigns Ohio Crushed-Stone Plant to Eliminate Circulating Loads 24

Soapstone and Talc Have Been Produced in Vermont for a Century 33

Effect of Grading of Gravel and Sand on Voids and Weights—Part II 37

Demand for Sand from New Plant Proves Wisdom of Preliminary Survey 42

Occurrences, Production and Marketing of Spars in Canada's Provinces 43

Operator Utilizes Excess Pea Gravel in Manufacture of Concrete Blocks 46

Increased Recovery of Phosphate in the Florida Land-Pebble District 49

Intake-Line Trap Prevents Large Stone from Entering Dredge Pump 53

Profits Accruing from Dust Control in the Pit and Quarry Industries 56

Men of the Industry 59
Personal Mention 60
Coming Events 61
Financial News 62
Traffic News and Comment ... 63
Latest Cement Statistics 65
Pumpings from the Old Pit ... 67
Review of Foreign Practice 69
Recent Patents 70
Legal Information 71
Insurance Problems Discussed 72
New Machinery and Supplies . 73
Manufacturers' Publications .. 76
New Corporations 76

Next Issue December 17, 1930

Published bi-weekly on Wednesday for producers and manufacturers of Sand, Gravel, Stone, Cement, Lime, Gypsum and other non-metallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

Copyright, 1930, by
COMPLETE SERVICE PUBLISHING CO.
538 South Clark St.
Chicago, Ill.

H. W. BAUMGARTNER, *President*
V. E. LARSEN, *Vice-President*
S. A. PHILLIPS, *Directing Editor*
ARTHUR J. HOSKIN, *Editor*
W. E. TRAUFFER, *Asst. Editor*
HARRY F. UTLEY, *Asst. Editor*

New York Representatives:
E. M. BUCK, 68-43 Clyde St.
Telephone *Boulevard 5259*
Forest Hills, L. I., N. Y.
V. A. LESLIE, 301 W. 108th St.
Telephone *Academy 7990*
New York, N. Y.

Cleveland Representative:
W. E. COATES, 2198 Elbur Road
Telephone *Boulevard 0688W*
Lakewood, Ohio

Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central, and South America; elsewhere $1 additional for each year. Single copies 20 cents.

Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Vol. XXI CHICAGO, DECEMBER 3, 1930 No. 5

Inland Ships Initial Cargo of Limestone

PLANT OUTPUT 7,500 TONS DAILY

The final step in the operations of the huge new crushing plant of the Inland Lime & Stone Co. at Port Inland, Mich., was satisfactorily performed recently when the steamer *Joseph Block* was loaded with 5,000 tons of stone for delivery at Indiana Harbor, Ind. The huge ore carrier, with a capacity of 10,000 tons, carried two compartments of open-hearth stone consigned to the Inland Steel Co. and two compartments of flux stone for the Youngstown Sheet & Tube Co., also located at Indiana Harbor.

This was the first actual test for the loading machinery at the Inland plant and its performance was very satisfactory to officials of the company who witnessed the loading. Due to the shallowness of the water, the vessel was not loaded to capacity. Dredging of the channel has not yet been completed. The work of dredging the harbor will not be finished until some time next year. Officials of the Inland Lime & Stone Co. plan to load four or five more boats this year before the lakes are closed to navigation.

The loading of the steamer was witnessed by many officials of the Inland Lime & Stone Co. C. B. Randall, president, and George J. Nicholson, vice-president of the company, arrived at Port Inland from Indiana Harbor on the *Joseph Block*. W. Sykes, assistant to the president of the Inland Steel Co., L. B. Block, works purchasing agent at Indiana Harbor, and Mrs. Phillip Block, came by train to view the operations.

Operations at Port Inland are progressing at a rapid pace with the plant operating 24 hours per day. The daily output is now 7,500 tons and 80,000 tons of stone are now on the dock ready for shipment. Next year the daily output is expected to be increased to 15,000 tons.

N. Y. Crushed-Stone Men Urge More Winter Work

The regular monthly meeting of the New York State Crushed Stone Assn. was held on Nov. 21 at the offices of the Eastern Rock Products, Inc., at Utica, N. Y. About 20 members attended the gathering which was presided over by H. J. Russell, vice-president. The meeting was followed by a dinner at the Fort Schuyler Club.

Business transacted included the appointment of a committee to nominate candidates for the election of officers at the annual meeting of the association to be held at Syracuse, Dec. 19, 1930. Another committee was appointed to arrange for transportation to the national convention which will be held at St. Louis in January. A. G. Seitz was placed in charge of this committee. From all indications the attendance from New York will be at least as great as in previous years.

A resolution was passed that the state legislature be requested to carry on state road and construction works to alleviate the unemployment situation. A committee was appointed to draft this resolution.

Report U. S. Gypsum Co. Is Planning Expansion

A sharp upturn in the price of the common stock of the United States Gypsum Co. has been one of the marked features of the financial world within the past few weeks, reflecting reports that the company is planning further expansion in the near future. Acquisition of another gypsum company is said to be imminent.

California Earth Plant Burns; Will Be Rebuilt

Fire caused approximately $175,000 damage to the plant of the Pasatone Diatomaceous Earth Co., at Bradley, Cal., recently. The plant is to be rebuilt in its entirety, according to W. R. Fontaine, Oakland, Cal., and F. A. O'Connell, San Jose, Cal., owners.

Bomb Blamed for Barge Blast Which Injured 7

Seven members of the crew of the sand-and-gravel barge, *Material Service*, were severely injured on November 30, near Chicago, when an explosion occurred in the ship's galley. The barge is owned by the Material Service Corp., Chicago, and was proceeding up the ship canal from Lockport, Ill., when the blast occurred. Officials are investigating the possibility of labor trouble as the cause, believing that disgruntled former employees may have placed a time bomb on the barge.

The vessel was valued at about $400,000.

Indiana Aggregates Concerns in Merger

FOUR PRODUCERS CONSOLIDATE

The incorporation of the South Bend Sand & Gravel Co., a consolidation of one Mishawaka, Ind., and three South Bend, Ind., sand and gravel companies, was announced recently at the offices of H. G. Christman & Co.

Companies included in the merger are the George J. Hoffman Sand & Gravel Co., in business since 1914; the Midget Sand & Gravel Co., in business for the past seven years; H. G. Christman Sand & Gravel Co., in business for the past seven years; and the Beyrer Brothers Sand & Gravel Co., in business for the past two years south of Mishawaka.

The four firms are to be given stock in the new corporation, incorporated at $500,000, in exchange for their holdings. Mr. Christman and Mr. Hoffman, who announced the consolidation, said that all the pits would be improved and remain in operation with headquarters at the Hoffman office, 3113 Lincolnway W., South Bend. The new company assumed control Dec. 1, with the installation of officers elected by the directors.

Directors are: George J. Hoffman, Herbert A. Hoffman, W. Howard Edwards, Cary R. Moore, J. Lloyd Beyrer, James R. Beyrer, Julius B. Christman, J. Fred Christman and Eugene H. Miller.

Indiana Crushed-Stone Plants to Remain Open

Arrangements to maintain production during the next four months have been made by fifteen Indiana crushed-stone companies, Dr. John H. Hewitt, secretary of Governor Harry G. Leslie's unemployment council, has announced.

Customarily the crushed-stone plants close during December, January, February and March.

The three months' pay roll will total approximately $300,000.

Decision of the companies thus to coöperate with the unemployment council was reached at a recent conference and given Dr. Hewitt by Dana Ward of Indianapolis, secretary of the Indiana Crushed Stone Association.

Building in October Shows Sharp Decline

TEN PER CENT UNDER SEPTEMBER

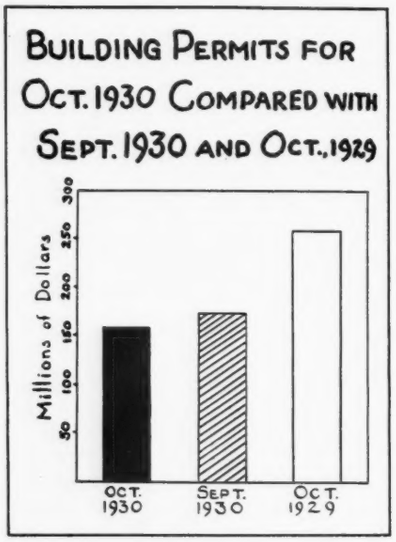
Marked declines were felt in the volume of building and construction operations planned throughout the United States during October compared with the preceding month and the same period last year, according to official reports of building permits as issued in 589 cities and towns and compiled by S. W. Straus & Co.

The volume of permits issued during October totalled $153,055,932 compared with $169,375,999 in September —a loss of 10 per cent. Normally an increase of about 5 per cent may be expected in October over September.

During October, 1929, building permits in the amount of $253,680,960 were issued, the month of October this year showing a loss of 40 per cent from last year.

In the group of 25 cities reporting the largest volume of building permits for October, the loss from September was 1 per cent and from October, 1929, 35 per cent. Ten of the cities went ahead of October last year, namely Cleveland, Kansas City, Mo., Oklahoma City, Long Beach, Cal., San Antonio, Tex., Seattle, Wichita, Kan., Yonkers, Tulsa, and Atlanta. Eight of the cities, Cleveland, Cincinnati, Kansas City, Mo., Oklahoma City, Long Beach, Cal., San Antonio, Tex., Wichita, Kan., and Dearborn, Mich., beat October, 1928, while sixteen cities forged ahead of September, 1930—namely, Cleveland, Cincinnati, Boston, Detroit, Kansas City, Mo., San Francisco, Washington, D. C., Oklahoma City, Long Beach, Cal., San Antonio, Seattle, Wichita, Kan., Yonkers, Tulsa, Atlanta, Ga., and Dearborn, Mich.

The Straus index of building permits for the month of October, 1930, was 45.2. This compares unfavorably with an index of 53.8 for September, 1930, and 74.8 for October, 1929. This is the lowest point that the index has reached since February of this year. The decline in the index of 8.6 per cent from September is particularly unfavorable as the seasonal factor ordinarily calls for an increase of 5 per cent. After corrections are made for seasonal variations, the index for October is 15.3 per cent below the general trend which has persisted downward for building permits since about the middle of 1926.



Some local reductions in building wage rates are being reported, although on the whole rates are fairly steady. Highway construction has already begun to taper off, thus throwing certain men out of work. A slight improvement in construction employment was reported in St. Louis.

There were few changes in the more important building materials in October. No price changes were reported in Portland cement and structural steel shapes. Common brick prices declined in Dallas, New Orleans, St. Louis, and Los Angeles, declines ranging from 50 cents to $4 per thousand. In Kansas City the price was raised 50 cents.

Stage Cement-Quarry Blast for U. S. Film

40,000 TONS OF ROCK SHOT DOWN

Forty thousand tons of rock were brought down with the explosion of 6,000 lb. of dynamite on Wednesday, Nov. 5, in the Northampton, Pa., quarries of the Universal-Atlas Cement Co. The blast was filmed by the Bureau of Mines of the United States Department of Commerce for the purpose of embodying quarrying methods in the story of cement, "Concrete Facts," one of the industrial films being made by the government for education purposes.

Scott Turner, director of the Bureau of Mines, and M. F. Leopold, the department's supervising engineer of productions, together with the government cameraman, Tierry Miller, made arrangements for the blast.

With the assistance of employees of the cement company the necessary shoring was built for the safety of the cameramen.

A double row of 5½-in. well-drill holes, 33 in number, were loaded with the powder which set off the blast.

Transit-Mixed Concrete Makers Convene Jan. 9-12

The National Assn. of Paris Transit-Mixed Concrete manufacturers, comprising more than fifty operators in the United States and Canada, will hold its annual convention in St. Louis, Mo., January 9 to 12.

The program for the convention is being made up now and will be announced later.

Beaver Cement Plant Is Closed for Improvements

The Beaver Portland Cement Co. has closed its plant at Gold Hill, Ore., for the winter and annual repairs are in progress, according to W. H. Muirhead, vice-president.

BUILDING AND ALTERATION PERMITS FOR OCTOBER, 1930, COMPARED WITH OCTOBER, 1929, AND SEPTEMBER, 1930

State	Oct., 1930	Oct., 1929	Sept., 1930	State	Oct., 1930	Oct., 1929	Sept., 1930
Alabama	$ 323,369	$ 635,179	$ 388,016	Nevada	$ 89,585	$ 511,050	$ 49,000
Arizona	207,939	488,912	445,724	New Hampshire	90,674	54,619	56,393
Arkansas	140,193	288,452	154,293	New Jersey	5,031,624	12,195,846	8,861,191
California	15,775,174	21,695,057	17,259,909	New Mexico	80,830	134,630	136,425
Colorado	722,596	1,257,921	1,092,093	New York	37,274,325	60,384,094	44,494,669
Connecticut	3,118,697	7,857,905	3,051,490	North Carolina	407,167	1,563,200	475,728
Delaware	245,040	987,800	256,911	North Dakota	118,184	782,414	244,459
District of Columbia	2,191,665	3,066,705	1,077,810	Ohio	13,828,853	18,346,996	10,529,640
Florida	1,309,146	2,048,009	1,565,574	Oklahoma	3,361,341	2,382,405	2,218,499
Georgia	1,139,847	1,112,018	945,045	Oregon	757,544	1,726,129	2,926,354
Idaho	142,271	206,939	107,454	Pennsylvania	8,193,661	15,149,762	9,676,760
Illinois	10,657,534	30,079,793	16,906,000	Rhode Island	953,360	2,107,543	966,277
Indiana	1,714,566	4,356,196	2,474,331	South Carolina	313,122	515,094	270,842
Iowa	1,185,226	1,208,787	1,104,705	South Dakota	193,275	382,016	221,435
Kansas	1,728,769	974,479	488,498	Tennessee	1,098,671	1,239,774	1,574,412
Kentucky	693,811	1,630,685	654,313	Texas	5,178,936	8,900,892	6,310,739
Louisiana	877,503	583,170	313,319	Utah	263,057	458,302	303,902
Maine	97,503	267,141	92,370	Vermont	11,000	31,000	65,000
Maryland	2,065,014	3,375,438	2,088,085	Virginia	1,281,252	1,192,006	1,643,268
Massachusetts	7,310,588	9,463,220	6,604,587	Washington	2,783,851	3,078,043	2,638,279
Michigan	5,878,824	17,489,833	7,957,421	West Virginia	845,377	380,521	455,187
Minnesota	1,805,507	2,090,253	2,760,701	Wisconsin	4,664,817	6,300,673	4,317,828
Mississippi	116,030	315,401	191,545	Wyoming	23,872	130,285	42,640
Missouri	3,192,379	2,803,713	2,405,620				
Montana	133,100	322,500	80,797	Totals	$152,044,657	$253,680,960	$169,375,999
Nebraska	520,852	1,128,158	430,461				

Quarry Blast Loosens 125,000 Tons of Rock

FIFTY-THREE HOLES ARE FIRED

About two years ago a new crushed-stone plant was put into production at Falling Springs, Ill., to furnish structural aggregates in the St. Louis territory. This plant, about eight miles southeast of East St. Louis, is owned by the Illinois Electric Limestone Co. A complete description of the plant at that time was published in the Jan. 16, 1929, issue of PIT AND QUARRY.

The limestone deposit lies beneath an overburden that varies in depth from 25 ft. to 40 ft. The stripping is done by a Marion 1¾-cu. yd. electric shovel which loads the dirt into Western 4-cu. yd. side-dump cars. The loaded cars are pulled to the waste dump by a Whitcomb 14-ton gasoline locomotive.

The face of the quarry varies from 70 ft. to 85 ft. in height. The blast-holes are sunk by a Sanderson No. 14 Cyclone electric well-drill with a 6-in. bit. A recent blast along several hundred feet of the quarry face dislodged approximately 125,000 tons of rock. In preparing for this shot, 53 holes were drilled to an average depth of 70 ft. Such a blast is sufficient to maintain a regular supply of raw material to the crushing plant for about two months.

In this instance sixteen tons of high explosives were consumed. These explosives were manufactured by the Illinois Powder Mfg. Co., of St. Louis, Mo., and were of the Gold Medal brand which has a nitroglycerine base. Two strengths were used—60 per cent and 40 per cent. The charge per hole averaged about 620 lb.

The 53 holes were fired simultaneously, Cordeau-Bickford fuse being the detonator. The effect proved wholly satisfactory to all concerned. Such a blast requires proper procedure in spacing the drill-holes, in selecting the correct explosives and detonators, and in loading the various holes.

For the best results the blast creates comparatively little noise. A layman who attended this shot was disappointed in this respect. He described it as a puff with only a slight tremor of the earth, and he learned that the noisy shots which are heard by residents in the vicinity of any well-operated quarry are not the big blasts of the face but are, instead, the secondary ones for breaking oversize masses of stone which cannot be loaded into the quarry cars.

J. D. Moore is president of the Illinois Electric Limestone Co., and A. C. Dodd is its superintendent. Walter Lepere is master mechanic and Ed. Harper is electrician.

Huge Barbecue to Mark Granite Plant's Opening

The opening of the new granite-crushing plant of the Weston & Brooker Co. at Cedar Rock, Ga., is scheduled for Dec. 10 and appropriate ceremonies will mark its advent into the field. A barbecue dinner is to be served and the guest list totals nearly 500 persons, including highway and railroad officials, road contractors, editors, bankers and leaders in other lines in Georgia, South Carolina and Florida.

Committees are now at work on details for the big event.

New Superintendent of Cement Quarry Honored

Frank Marion, recently promoted to the superintendency of the Oklahoma Portland Cement Co. quarry at Lawrence, Okla., was honored by his follow employees and plant executives at a mass meeting recently.

Claude Rodarmel, plant superintendent, paid tribute to Mr. Marion and his record of nineteen years with the company. M. G. Matthews, local manager, after speaking of Mr. Marion's outstanding achievements in high production and effective safety work and his ability in getting his men to work with him to attain them, presented the new superintendent with a gold watch.

Formerly track foreman of the Oklahoma company, Mr. Marion has been continuously employed since 1908. He is 67 years old.

New Gypsum Products Recently Introduced

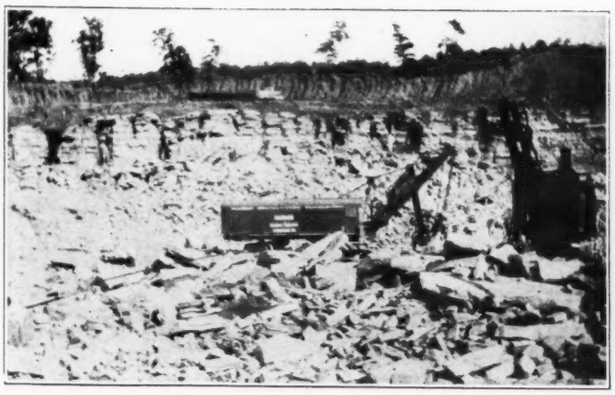
INCREASING MARKET PREDICTED

Several new products consisting primarily of gypsum have been recently introduced and may lead to an increasing use of this material, according to the U. S. Bureau of Mines. An extremely hard, dense plaster, suited primarily for architectural casting, was recently placed on the market. On the West coast, producers of gypsum products have developed a wallboard that may be bent or folded to conform to structural needs. Gypsum lath that folds and is more or less flexible so as to simplify its application to intricately designed interior structures is also a new development. A new method for fastening wallboard and lath to steel-structural members was devised. Considerable research work was done to develop acoustical wall-boards, and gypsum acoustical ducts that prevent the transmission of sound through ventilator shafts were placed on the market. Some companies are producing artificial travertine, using gypsum as the principal material.

A process was patented for casting concrete objects in porous plaster molds. The plaster molds absorb a considerable portion of the water in the concrete mixture, resulting in a concrete object of great strength.

The manufacture of white cements (having excellent cementing properties) from anhydrite is receiving considerable attention and points the way to the economical use of enormous tonnages of material now considered waste. Cements made by patented processes develop strengths of 500 to 550 lb. in 24 days and 800 lb. in 28 days, and are hard enough to take a high polish. It is said that they can be calcined at fuel costs comparable with present practices in calcining ordinary gypsum.

In the Middle-west and East the manufacture of gypsum lumber made considerable progress during the year, and it is reported that the future of this gypsum product is very promising.



Electric Limestone quarry after the blast.

The Electric Limestone crushing plant.

Praise Safety Record of Medusa Cement Co.

NO ACCIDENTS TO DATE IN 1930

Employees and department heads of the Medusa Portland Cement Co. plant at Dixon, Ill., celebrated the establishment of a new record Saturday evening, Nov. 14 in their first "no-accident" program and banquet. The Dixon plant now rates with seven of the eight mills of the Medusa Portland Cement Co. in not having a lost-time accident thus far this year. The Dixon mill has until December 31 to continue with this record in order to receive a Portland Cement Assn. trophy for its fine record.

Two years ago the Dixon plant had the most lost-time accidents among the eight mills of the Medusa company and every speaker on the Nov. 5 program held at the Elks' Club in Dixon congratulated every employee of the plant for the fine record that has been made thus far this year in bringing the plant from the bottom to the leading position.

Phillip Mooney of the Dixon plant acted as toastmaster at the business session which followed the fine banquet. Mayor Frank D. Palmer spoke briefly, congratulating the department heads and every employee of the cement plant for the enviable record which has been established this year. He was followed by E. J. Maguire, vice-president of the Medusa company and W. L. White, general superintendent, both of Cleveland, who gave congratulatory talks.

Dr. E. S. Murphy, company physician; William Powell, safety director of all the Medusa plants, with headquarters at Cleveland; President R. W. Sterling, of the Dixon Chamber of Commerce, J. Frank Bennett, secretary-treasurer of the Reynolds Wire Co. and A. P. Armington, president Dixon National Bank, gave short talks.

The feature address of the evening was delivered by H. A. Parish of Chicago, head of the safety department of the Chicago & Northwestern R. R. He used motion pictures of the yards and shops of the Northwestern to illustrate the safety campaign as practiced by the railroad, all of which proved both interesting and instructive.

New Hampshire Gypsum Plant Damaged by Fire

Fire which for a time threatened to destroy the plant of the Atlantic Gypsum Products Co. at Freeman's Point near Portsmouth, N. H. on Nov. 8 was finally confined to building No. 6 at a loss estimated at $125,000.

The fire, which was the most spectacular for years in that section according to press reports, drew thousands of spectators to the scene as the clouds of smoke could be seen for miles.

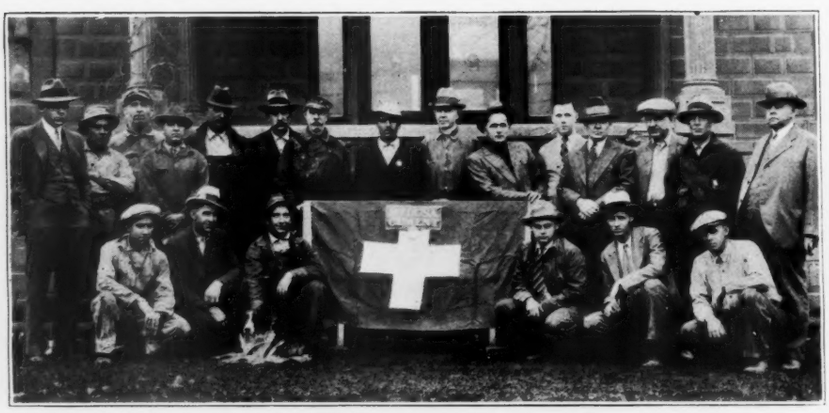
The fire started in the lower floor of the building and was discovered early, but lack of water pressure let the fire get out of control. Fanned by a strong breeze it spread through the long building and by the time the fire department reached the scene the plant was a roaring furnace.

To Build New Plant at Salt Dome Near Houston

A new Houston, Tex., industry, to represent an investment of $1,000,000, employ more than 100 men and manufacture chemicals, was announced by officials of the Saline Chemical Co., which was granted a charter on November 7.

The new plant will be built immediately at Pierce Junction on property owned there on top of what is known as the Pierce Junction salt dome. The company will develop salt resources of the region and convert them into chemicals.

W. S. Hipp is president. Before his retirement from the contracting business, Mr. Hipp was regarded as one of the foremost construction engineers of the Southwest. Beside his duties, Mr. Hipp will take an active part in the construction of the new plant.



Safety committee at Medusa's Dixon, Ill., plant. W. L. White, general superintendent at extreme left; W. E. Wuerth, plant superintendent, extreme right.

Oregon Gravel Plant Grew Up With West

OUTPUT EXCEEDS 500,000 CU. YD.

Not far from Umatilla, Ore., along the Columbia River, but more than one hundred feet above it, is a glacial deposit which constitutes a natural asset of the Jones-Scott Co. (named from Lowden Jones and J. S. Scott), with headquarters in Walla Walla, Wash.

With the development of railroads in the Pacific Northwest, search was made for suitable ballast material and this deposit was discovered. A portion of it was on railroad land and the Union Pacific Railway Co. permitted the removal of the gravel provided it was shipped over its lines. Fearing this practice might be discontinued, Mr. Scott purchased an adjoining 60 acres which took in the major portion of this gravel deposit. The Jones-Scott Co. took out the first gravel from these holdings for the concrete work on the bridge at Ayer Junction.

As construction work of various kinds got under way with the development of the country, the pit was equipped with a steam-shovel plant for bringing the gravel to the railroad and, later, the steam shovel was replaced by Diesel draglines.

With the further development in construction, added improvements have been made to meet the demands for material of more uniform sizes and for washed grades.

Since the pit was opened more than twenty years ago, more than one-half million cubic yards of gravel have been excavated. The rim of the pit is about one-fourth mile in length, and the depth is approximately 85 ft. Near the center of the pit is a huge field hopper into which the gravel is handled by a dragline that is powered by a 4-cylinder 60-hp. Diesel engine. From the hopper the material drops to a belt conveyor and is moved about 150 ft. along the floor of the pit to a Diesel-driven crusher which is set at 2-in. discharge opening. Another belt conveyor takes the mixed crushed and raw material a distance of 450 ft. and on a rise of 45 ft. to the edge of the pit where it is passed through another crusher before being hoisted to the top of the washery by a chain-and-bucket elevator. The second pit conveyor, the secondary crusher and the bucket elevator are powered by a single 50-hp. Diesel engine.

Pit-run material can be elevated to the plant by by-passing the crushers. Accordingly the trommels are provided with perforations which permit the preparation of gravel in grades from 3-in. down to ¼-in. Water for washing is taken from a 360-ft. well.

The plant's capacity is 400 cu. yd. per day. It is operated by Superintendent D. C. Chapman and six employees. In addition to this plant, the Jones-Scott Co. operates a sand pit at Sand, not far from Wallula.

Street Design Being Studied by A. R. B. A.

REPORT AT ST. LOUIS CONVENTION

Interesting and valuable studies about the financing, construction, maintenance and use of city pavements are in progress by the City Officials' Division of the American Road Builders' Assn. Reports giving the results of these studies will be presented at the annual convention and road show of that Association to be held in St. Louis, January 12-16, 1931.

The studies include a detailed investigation of conditions in 20 representative cities with regard to:

1. Assessment practice for pavements.
2. Design and construction of pavements.
3. Maintenance of city streets of all types including snow removal and street cleaning.
4. Street capacities.

The purpose of these studies is to effect standardization of methods so that economies may be accomplished in the financing, construction, maintenance and use of city pavements.

The reports have been prepared from data obtained by special investigative engineers who have visited these cities to collect first-hand information. The cities studied include New York, Chicago, Philadelphia, Cleveland, St. Louis, Baltimore, Washington, New Orleans, Kansas City, Indianapolis, San Antonio, Louisville, Houston, Memphis, Oklahoma City, Richmond, Des Moines, Jacksonville, and Galveston.

Denver Sand-and-Gravel Company Reorganizes

New officers have been named by the J. W. Brannan Sand & Gravel Co. of Denver, Colo., following the recent death of J. W. Brannan, founder and head of the concern. They are: F. P. Spratlen, Jr., president-treasurer; Lloyd S. Brannan, vice-president-secretary; and Mrs. Laura S. Brannan, second vice-president.

Fire Damage $50,000 at Maryland Cement Plant

Fire early on the morning of Nov. 4 swept two buildings of the North American Cement Co. plant at Security, Md., two miles from Hagerstown, with a loss estimated in excess of $50,000.

The Hagerstown fire department was called to the blaze shortly after midnight and succeeded in saving all buildings of the company, except the bag-cleaning and storage buildings, which were destroyed.

The cause of the blaze could not be ascertained, though firemen said it started in a bin in the bag-cleaning building.

E. S. Guth, superintendent of the plant, said the loss would exceed $50,000, including a quantity of cement which was ruined by water. More than 500,000 empty bags were stored in the warehouse, a large number of which were destroyed.

Long Island Town Seeks to Enjoin Gravel Firm

Suit has been filed against the Metropolitan Sand and Gravel Co. by the village of Asharoken, Long Island, N. Y., and has been ordered tried in Riverhead, L. I., next month, according to the *New York Times*.

The suit is for a permanent injunction against the company to restrain it from dredging in Northport harbor. The village contends that such dredging and the construction of jetties will cause serious damage to the waterfront at Asharoken, and that such dredging is in violation of the zoning ordinance.

The plaintiff recently applied for a temporary injunction to restrain the sand and gravel company from doing any further work until the suit was settled.

Delays Construction of Portland-Cement Plant

Construction on the proposed plant of the New Yazoo Portland Cement Co., Inc., at Vicksburg, Miss., has been postponed until after the first of the year, according to St. George T. Cordell, secretary-treasurer of the concern. No contracts have been let as yet.

Ste. Genevieve Lime Co. Is Reconstructing Plant

The Ste. Genevieve Lime & Quarry Co. is completely rebuilding and remodeling its plant at Ste. Genevieve, Mo. All-steel construction and kilns of the latest type will be features of the new plant.

Florida Fullers' Earth Company Installs Mill

The Fullers' Earth Co., Midway, Fla., recently completed a new mill costing $100,000 doubling the capacity of the plant. The mill was manufactured and erected by the Allis Chalmers Co. and the all steel work for construction was furnished by the Ingalls Iron Works of Birmingham, Ala.

"Business has been good with us all summer; we have been running night and day at capacity," according to A. E. Bagnall, general manager.

Riverside Cement Adds Storage Silos at Plant

A number of improvements and repairs, including the construction of additional storage silos, are being made at the plant of the Riverside Cement Co., Crestmore, Cal., during the shutdown period.

To Hold 25 Regional Safety Meets in '31

EXPECT THAT 25,000 WILL ATTEND

A total of 25 regional safety conferences will be held in various parts of the country during the coming year, it has been announced by the National Safety Council. The gatherings will be held for the discussion of industrial, public and home accidents as well as traffic problems.

These conferences will be held either under the auspices of the National Safety Council or in coöperation with that organization. In many cases local safety councils will sponsor the meetings.

It is estimated from past experience that an average of 1,000 delegates will attend each gathering. Many cities now plan a regional safety conference as an annual event.

Each conference will stress the safety problems peculiar to the region surrounding the conference city. Individual plant-safety problems can thus be discussed by superintendents, foremen and workers in allied industries.

Dates have already been announced for eight of the conferences. They are:

November 12, Augusta, Me.—Third Annual Maine Safety Conference.

November 13 and 14, High Point, N. C.—North Carolina State-Wide Safety Conference.

December 1, 2 and 3, Syracuse, N. Y.—Fourteenth Annual Safety Congress of N. Y. State Department of Labor.

December 4, Allentown, Pa.—Eastern Pennsylvania Safety Conference.

March 12, Chicago—Ninth Annual Midwest Safety Conference.

April 17, Pittsburgh—Eighth Annual Safety Engineering Conference.

April 29-30, Boston—Massachusetts Annual State Safety Conference.

May 1, Rockford, Ill.—Rock River Valley Safety Conference.

Dates for the remaining conferences are to be announced shortly.

Pioneer Iowa Sand-and-Gravel Producer Killed

E. E. Boynton, Sr., died last month at an Iowa City, Ia., hospital of injuries sustained in an automobile accident. Mr. Boynton was president and treasurer of the Northern Gravel Co. of Muscatine, Ia., where he resided and had been prominently identified in the sand-and-gravel industry since 1910. Mr. Boynton was born in Lawrence, Mass., in 1850 and came to Iowa in his boyhood.

E. W. Boynton, Jr., a son of the deceased, and secretary and general manager of the Northern Gravel Co., who was driving the car when the crash occurred, was seriously though not critically injured.

Panoramic view of the quarry and plant of C. C. Beam, Inc. Drilling and stripping are being carried on at the left.

Redesigns Ohio Crushed-Stone Plant to Eliminate Circulating Loads

Elaborate Chute System, Water Supply and Distribution Are Features of Operations

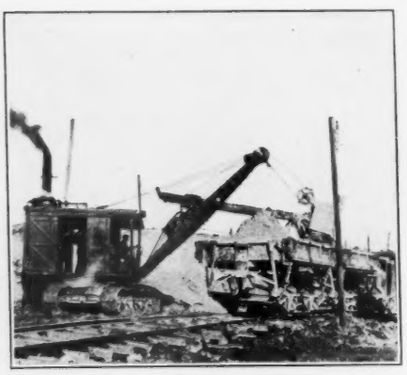
By M. F. BEISBER

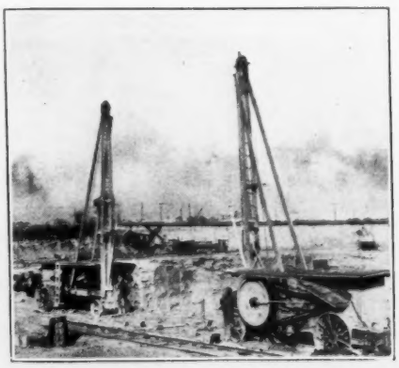
THE year 1930 has seen many aggregate plants rebuilt or enlarged to meet the ever-increasing demand for road-construction and building materials. Many of these plants have been given new equipment; not a few, however, have been rebuilt from the ground up.

One of Ohio's most prominent producers of crushed limestone, C. C. Beam, Inc., of Melvin, belongs to this latter class, having redesigned and completely rebuilt its equipment for processing and handling materials and making extensive structural-steel additions.

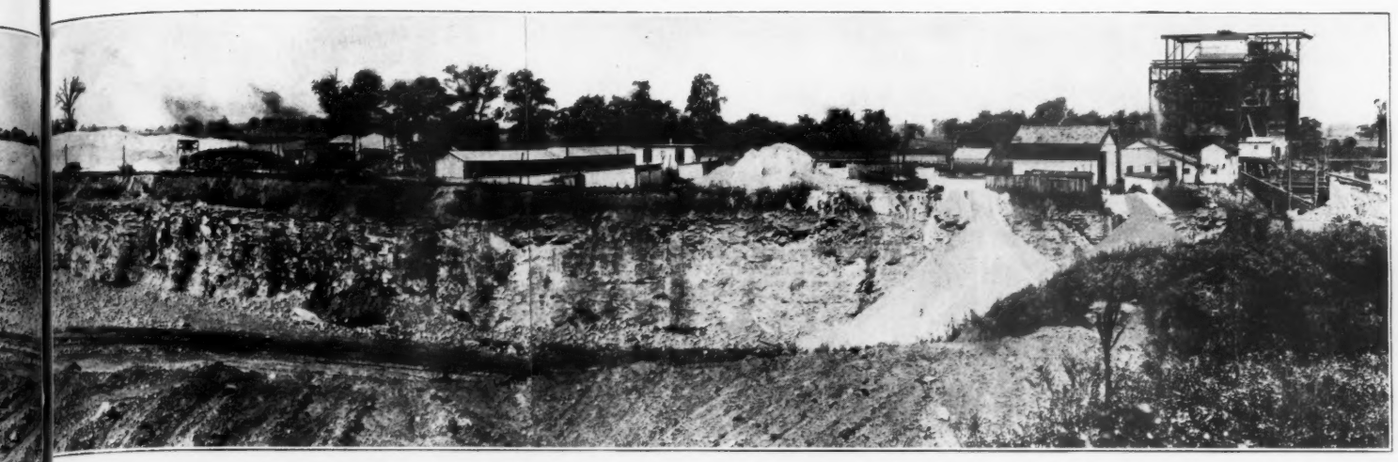
Mr. Beam, like many other successful men in the industry, began his career with a small portable plant. In 1904 he operated several portable plants, moving from place to place, supplying counties, townships, and contractors with crushed stone. The capacity of these plants was small, indeed. In 1919, an opportunity came to furnish crushed stone to a contractor for an 11-mile macadam road. The present location was the site of the portable plant for this contract. Upon completion of the project, every effort was put forth to establish a permanent plant, taking advantage of the Baltimore and Ohio R. R. right-of-way which adjoins the property. The first six years at this location were not successful but, by persistent reductions in production costs, the present large plant has resulted. The Beam company has, today, one of the best designed plants in the country, with a capacity increased to 300,000 tons per year.

Twelve vibrating screens, capable of screening and washing every grade of material in the 1,500-ton daily output, feature the rebuilt plant. This is one of the largest installations of vibrating screens in this region and is the first major installation of the new Allis-Chalmers vibrating screens which were announced by this company early in 1930.





(Above)—Well drills operating on ledge.
(Left)—Stripping overburden and stone sediment.
(Right)—Steam shovel loading rock in quarry.



The crushing plant is seen at the extreme right. Note agstone stock-piles in background at center of picture.

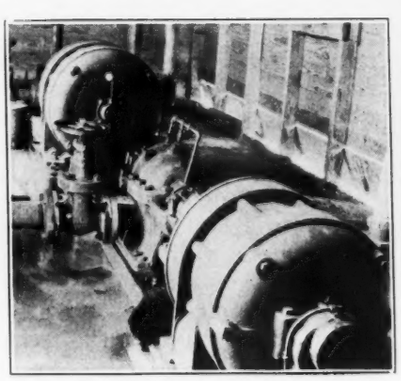
A new addition has been built to accommodate the primary scalping and the classifying screens as well as the secondary crushers and the primary-crusher elevator. This building has three levels, access to each level being gained by steel and concrete stairways. A crane, equipped with a hand-operated chain-block, travels on rails mounted on the columns just beneath the roof trusses. Access to the equipment on any level is made by removing the sections of flooring on each level. These sections are of timber planking in convenient sizes for ease in handling.

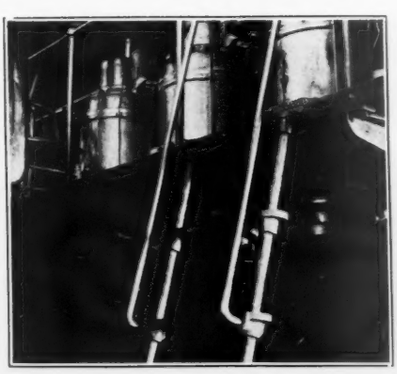
New floors, too, have been added to the original building to provide space for the washing screens and the two plant elevators. Above the top floor a steel framework carries another traveling crane, this one having a span of the 32 ft. It is equipped with a Yale hand-operated 6-ton hoist. Floors in this building also are built in removable sections to provide the crane access to equipment on the lower levels.

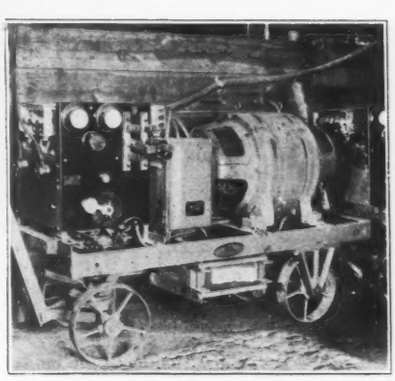
An interesting feature of the Beam plant is its arrangement of the vibrating screens and other materials-handling equipment. Circulating loads on the elevators, so common in the average crushed-stone plant where classification takes place in screens on the top-most floor, are eliminated. Two vibrating screens, located in the new addition, reject oversize material and classify the crushed rock, sending these grades to the two secondary crushers or to the two plant elevators. In other words, before reaching the main classifying and washing screens, the materials are entirely crushed to the desired sizes. Consequently, no rejects come back, thus freeing the two plant elevators of circulating loads.

The limestone deposit covers 68 acres. At present, six acres have been worked to a depth of from 30 to 50 ft. Overburden varies in depth from 3 ft. to 12 ft. It includes much ground limestone that has been deposited in large settling ponds that are created to conserve the water supply. A large pond, having earthen banks is thrown up by an excavator, in advance of stripping operations, to allow the precipitation of the limestone fines that are held in suspension in the wash-water. When the pond is thus filled with sediment, a new pond is built, and the deposited sediment is removed along with the waste overburden. After further development of the quarry, provision will be made to allow the wash-water to settle in the old quarry floor.

Stripping is carried on almost constantly. A Massillon No. 22 excavator equipped with a 1-cu. yd. dipper digs the material and loads it to trains of Koppel 6-cu. yd. side-dump cars. A Plymouth 8-ton gasoline locomotive draws the cars over standard-gauge track to the opposite side of the quarry. Here the cars are dumped alongside the track and a Cletrac 30 tractor, equipped with a bulldozer, moves the waste material over the brink into the abandoned portion of the quarry. By using the tractor, the cars are





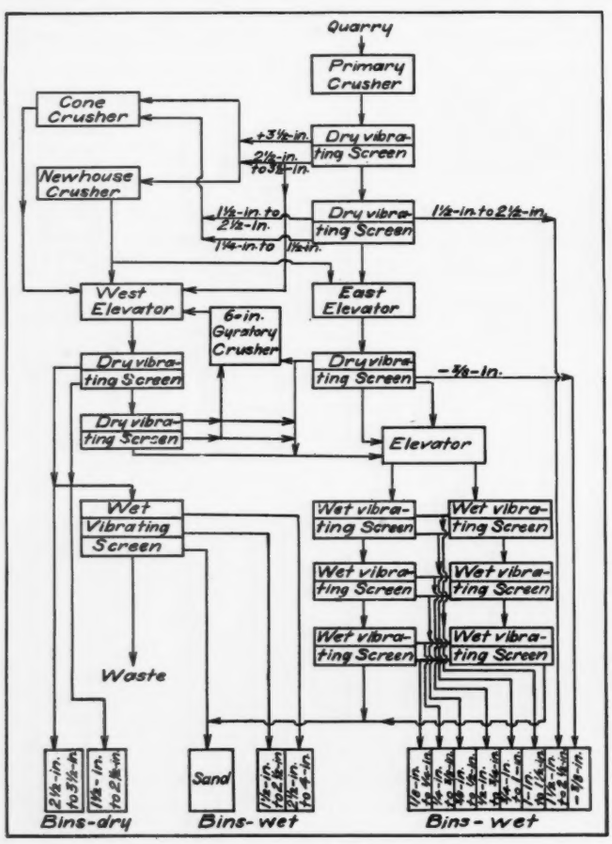


(Above)—The 4-cylinder semi-Diesel engine.
(Left)—Centrifugal pumps supplying wash water.
(Right)—Portable electric welding outfit.

Unusual photograph of blast in Beam quarry. Note uniform movement of rock strata.

not dumped close to the brink, eliminating the necessity of frequent track shifting. The use of the tractor and bulldozer permits rapid movement of the cars and results in a clean, evenly-spread waste-dump.

One of the interesting developments of the Beam company is its manufacture of explosives. With the coöperation of C. E. Bedient, explosives engineer, a new type of explosive has been developed and patented. Essentially, it has a chlorate-of-potash base, the ingredients being encased in waterproof paraffined tubing, in lengths from 2 to 10 ft. Usually a 10-ft. length of this explosive is lowered to the bottom of the hole, with a short length placed near the top—depending on the depth of the hole. At a shot photographed by the writer, 13 holes were loaded with a total of 1,110 lb. of tube explosive. An excellent upheaval dislodged 2,670 tons of rock. The present run of stone is a dolomite averaging 54 per cent calcium carbonate and 44 per cent magnesium carbonate. Holes are drilled with two Loomis Clipper well-drill rigs to a depth of 30 or more feet. Each drill rig is equipped with 4-in. stems and 5-in. bits. The holes are spaced 9 ft. apart and 8 ft. back from the face and, usually, 8 to 13 holes are fired at one time. Cordeau-Bickford fuse is used exclusively.



Flow-sheet of the C. C. Beam plant.

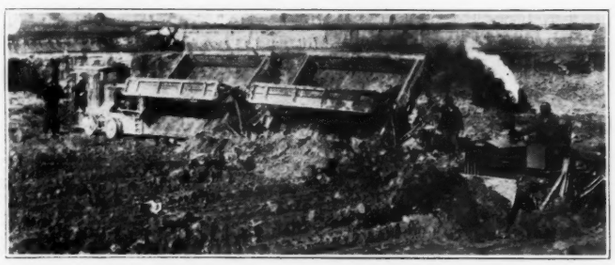
Gasoline locomotive and car in stock-pile service.

Blasted rock is loaded into trains of Easton end-dump quarry cars drawn by Plymouth gasoline locomotives. A Marion No. 61 excavator mounted on crawler treads and equipped with a 2½-cu. yd. dipper handles the stone to the cars. Since the excavator is more than 900 ft. from the plant incline, two trains of cars are constantly transporting raw material to the incline. While one train proceeds to the incline, the other returns, from a sidetrack position, to be loaded. This use of two trains assures a steady supply of material to the crusher and eliminates much of the time that would be lost in loading if only one train were employed. Nineteen Easton cars, each with a capacity of 4-cu. yd., and two Plymouth gasoline locomotives—one a 3-ton unit, the other a 5-ton unit—make up the quarry transportation equipment. The gauge of the track is 4 ft.

Upon arriving at the plant the locomotive spots the train of loaded cars on a short length of track at the foot of the incline track. This track has a slight down-grade to the incline track, gravity automatically bringing the train into hooking position as each car is drawn to the crusher. The down grade permits the locomotive to be released immediately upon arrival, returning to the sidetrack with a train of empty cars.

Cars are drawn up the incline by an Austin double friction-clutch quarry hoist at a speed of 400 ft. per min. Since the incline has a length of 300 ft., 45 seconds are required to hoist a car to the crusher hopper.

Primary crushing of blasted rock to 6-in. size takes place in a McCully 30-in. gyratory crusher built by the Worthington Pump & Machinery Co. It is driven by a Fairbanks-Morse 4-cylinder, 200-hp. oil engine which also furnishes power to the incline hoist. The spider of the crusher, located at the



Dumping waste material; tractor with bulldozer on right.

plant ground-level, is inclosed by a 17-ft. by 19-ft. steel box about 18 in. high to prevent boulders from flying about when dumped from the quarry cars. Two Curtis air hoists and a Tribloc 20-ton hoist traveling on an I-beam spanning the operating floor, facilitate in handling and moving unwieldy boulders into the mouth of the crusher.

The crushed material drops into a steel surge bin before being fed to the bucket elevator. This surge bin is one of the many features of the plant, as it insures a steady flow of material to the screening equipment, despite fluctuations in the arrival of cars from the quarry. It is 8 ft. by 9 ft. by 10 ft. deep, with a self-cleaning bottom loading a pan feeder. It has a capacity of 12 tons.

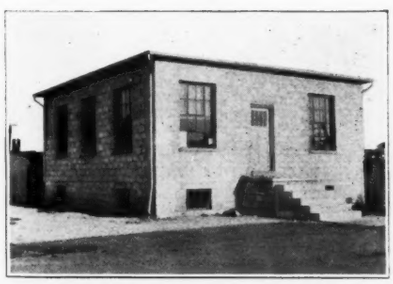
At this point provision is made for sending material in carload quantities through the screening and secondary crushing equipment, without passing it through the primary crusher. A steel hopper located beneath one of the sidetracks used for car-loading receives the material from the cars and, by means of a pan conveyor, transfers it to the surge bin. The company owns four gondola cars, each rated at 60,000-lb. capacity, and an industrial Brownhoist 1½-cu. yd. locomotive crane, as well as a new Plymouth 30-ton gasoline locomotive. Extensive stock-piles can be formed and later reclaimed by means of the locomotive crane and the gondola cars. When it is desired to reclaim stocked material, the cars are loaded at the piles and dumped into the pan conveyor hopper. The latter is 12 ft. square and feeds a Webster 24-in. pan conveyor 32 ft. 6 in. long. A General Electric 5-hp. motor serves as its drive.

The surge bin is equipped with a Webster 36-in. pan-conveyor feeder 8 ft. in length, driven by an Allis-Chalmers 5-hp. slip-ring, variable-speed motor through a Falk speed reducer. Material from the feeder falls directly into the buckets of the Webster elevator which deposits it on the top deck of the scalping screen. This elevator is 78 ft. long on pulley centers and is equipped with 30-in. by 16-in. by 18-in. steel buckets. It is powered by a 40-hp. motor through an Allis-Chalmers Texrope drive. Upon reaching the top deck of the scalping screen, the material receives its first processing.

Before proceeding with a description of the processing equipment, it will be well to point out the flexibility of the spouting system used in handling the materials from one point to another. Referring to the flow sheet, it will be noted that five classifying screens which handle dry materials have spouts so arranged that the flow of materials can be directed in several ways, according to shipping requirements. The Allis-Chalmers screens are all equipped with 4-ft. by 8-ft. sashes so that any deck can be changed quickly or even a whole screen unit can be eliminated from the circuit without seriously tying up the flow of materials. A large stock of screen sash is kept on hand for replacement needs. A description of the spout arrangement is given later.

For the primary classification of materials on the scalping screen, the first deck has apertures which reject the 3¾-in. and larger material, either to the Symons cone crusher or to the Allis-Chalmers Newhouse crusher. Throughs from the top deck fall to the second deck, which has a 2½-in. screen. No. 1 stone is made on this deck and this material can be sent to either of the two crushers or to the west elevator system.

A second vibrating screen mounted directly be-



The general office of the C. C. Beam organization.

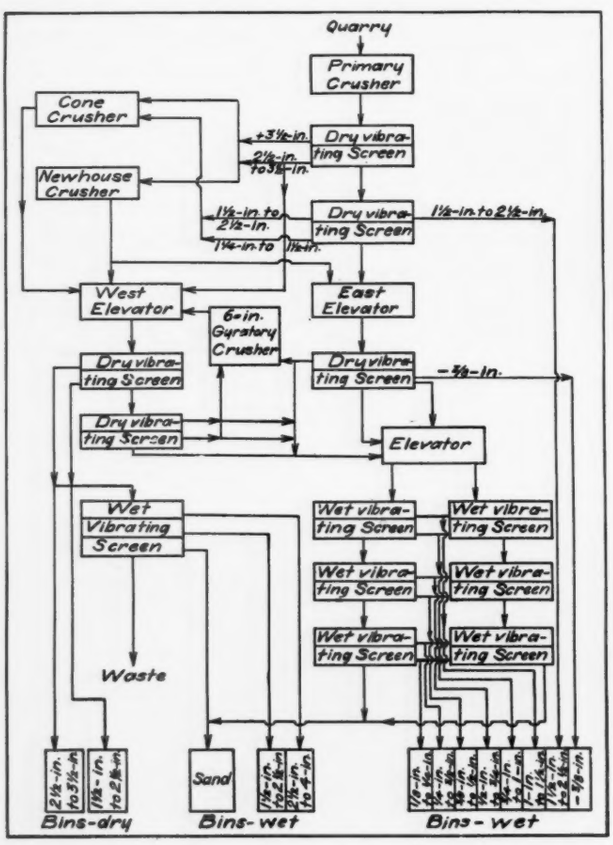
Paul Beam and C. C. Beam at left with two sons.

Superintendent's office and scale room for weighing trucks.

Unusual photograph of blast in Beam quarry. Note uniform movement of rock strata.

not dumped close to the brink, eliminating the necessity of frequent track shifting. The use of the tractor and bulldozer permits rapid movement of the cars and results in a clean, evenly-spread waste-dump.

One of the interesting developments of the Beam company is its manufacture of explosives. With the coöperation of C. E. Bedient, explosives engineer, a new type of explosive has been developed and patented. Essentially, it has a chlorate-of-potash base, the ingredients being encased in waterproof paraffined tubing, in lengths from 2 to 10 ft. Usually a 10-ft. length of this explosive is lowered to the bottom of the hole, with a short length placed near the top—depending on the depth of the hole. At a shot photographed by the writer, 13 holes were loaded with a total of 1,110 lb. of tube explosive. An excellent upheaval dislodged 2,670 tons of rock. The present run of stone is a dolomite averaging 54 per cent calcium carbonate and 44 per cent magnesium carbonate. Holes are drilled with two Loomis Clipper well-drill rigs to a depth of 30 or more feet. Each drill rig is equipped with 4-in. stems and 5-in. bits. The holes are spaced 9 ft. apart and 8 ft. back from the face and, usually, 8 to 13 holes are fired at one time. Cordeau-Bickford fuse is used exclusively.



Flow-sheet of the C. C. Beam plant.

Gasoline locomotive and car in stock-pile service.

Blasted rock is loaded into trains of Easton end-dump quarry cars drawn by Plymouth gasoline locomotives. A Marion No. 61 excavator mounted on crawler treads and equipped with a 2½-cu. yd. dipper handles the stone to the cars. Since the excavator is more than 900 ft. from the plant incline, two trains of cars are constantly transporting raw material to the incline. While one train proceeds to the incline, the other returns, from a sidetrack position, to be loaded. This use of two trains assures a steady supply of material to the crusher and eliminates much of the time that would be lost in loading if only one train were employed. Nineteen Easton cars, each with a capacity of 4-cu. yd., and two Plymouth gasoline locomotives—one a 3-ton unit, the other a 5-ton unit—make up the quarry transportation equipment. The gauge of the track is 4 ft.

Upon arriving at the plant the locomotive spots the train of loaded cars on a short length of track at the foot of the incline track. This track has a slight down-grade to the incline track, gravity automatically bringing the train into hooking position as each car is drawn to the crusher. The down grade permits the locomotive to be released immediately upon arrival, returning to the sidetrack with a train of empty cars.

Cars are drawn up the incline by an Austin double friction-clutch quarry hoist at a speed of 400 ft. per min. Since the incline has a length of 300 ft., 45 seconds are required to hoist a car to the crusher hopper.

Primary crushing of blasted rock to 6-in. size takes place in a McCully 30-in. gyratory crusher built by the Worthington Pump & Machinery Co. It is driven by a Fairbanks-Morse 4-cylinder, 200-hp. oil engine which also furnishes power to the incline hoist. The spider of the crusher, located at the

Dumping waste material; tractor with bulldozer on right.

plant ground-level, is inclosed by a 17-ft. by 19-ft. steel box about 18 in. high to prevent boulders from flying about when dumped from the quarry cars. Two Curtis air hoists and a Tribloc 20-ton hoist traveling on an I-beam spanning the operating floor, facilitate in handling and moving unwieldy boulders into the mouth of the crusher.

The crushed material drops into a steel surge bin before being fed to the bucket elevator. This surge bin is one of the many features of the plant, as it insures a steady flow of material to the screening equipment, despite fluctuations in the arrival of cars from the quarry. It is 8 ft. by 9 ft. by 10 ft. deep, with a self-cleaning bottom loading a pan feeder. It has a capacity of 12 tons.

At this point provision is made for sending material in carload quantities through the screening and secondary crushing equipment, without passing it through the primary crusher. A steel hopper located beneath one of the sidetracks used for car-loading receives the material from the cars and, by means of a pan conveyor, transfers it to the surge bin. The company owns four gondola cars, each rated at 60,000-lb. capacity, and an industrial Brownhoist 1½-cu. yd. locomotive crane, as well as a new Plymouth 30-ton gasoline locomotive. Extensive stock-piles can be formed and later reclaimed by means of the locomotive crane and the gondola cars. When it is desired to reclaim stocked material, the cars are loaded at the piles and dumped into the pan conveyor hopper. The latter is 12 ft. square and feeds a Webster 24-in. pan conveyor 32 ft. 6 in. long. A General Electric 5-hp. motor serves as its drive.

The surge bin is equipped with a Webster 36-in. pan-conveyor feeder 8 ft. in length, driven by an Allis-Chalmers 5-hp. slip-ring, variable-speed motor through a Falk speed reducer. Material from the feeder falls directly into the buckets of the Webster elevator which deposits it on the top deck of the scalping screen. This elevator is 78 ft. long on pulley centers and is equipped with 30-in. by 16-in. by 18-in. steel buckets. It is powered by a 40-hp. motor through an Allis-Chalmers Texrope drive. Upon reaching the top deck of the scalping screen, the material receives its first processing.

Before proceeding with a description of the processing equipment, it will be well to point out the flexibility of the spouting system used in handling the materials from one point to another. Referring to the flow sheet, it will be noted that five classifying screens which handle dry materials have spouts so arranged that the flow of materials can be directed in several ways, according to shipping requirements. The Allis-Chalmers screens are all equipped with 4-ft. by 8-ft. sashes so that any deck can be changed quickly or even a whole screen unit can be eliminated from the circuit without seriously tying up the flow of materials. A large stock of screen sash is kept on hand for replacement needs. A description of the spout arrangement is given later.

For the primary classification of materials on the scalping screen, the first deck has apertures which reject the 3¾-in. and larger material, either to the Symons cone crusher or to the Allis-Chalmers Newhouse crusher. Throughs from the top deck fall to the second deck, which has a 2½-in. screen. No. 1 stone is made on this deck and this material can be sent to either of the two crushers or to the west elevator system.

A second vibrating screen mounted directly be-

The general office of the C. C. Beam organization.

Paul Beam and C. C. Beam at left with two sons.

Superintendent's office and scale room for weighing trucks.

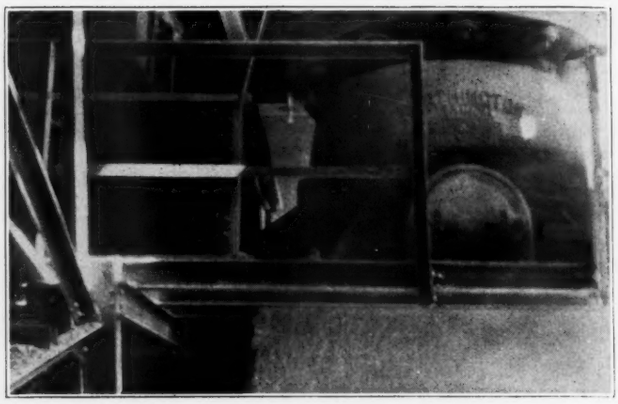
Loading one of the long sticks of explosive into a quarry hole.

low the scalping unit receives the throughs on its first deck which has a 1½-in. mesh. No. 2 stone is made on this deck and it can be sent to the cone crusher, to the west elevator or to a bin. No. 3 stone can be made from the second deck of this screen which is a 1¼-in. mesh. This material is sent directly to the cone crusher, while the throughs are sent to the east elevator system for further classification and washing.

The secondary crushing units are a Symons 4-ft. cone crusher and an Allis-Chalmers Newhouse crusher, placed side by side. The Symons crusher is driven from a Fairbanks-Morse 100-hp., 2 cylinder oil engine. The Newhouse crusher is, of course, direct-driven from its own motor. Crushed stone from the Symons unit is chuted to the west elevator. Stone from the Newhouse unit can be sent to either the east or the west elevator.

The two elevators referred to are of Webster make, 72 ft. long on centers. They are equipped with 24-in. buckets and are driven from one 40-hp. motor. A control house shelters the head shafts of the conveyors and the motor and gear-drive equipment. If necessary, either elevator can be operated independently of the other through a clutch arrangement on the head shaft.

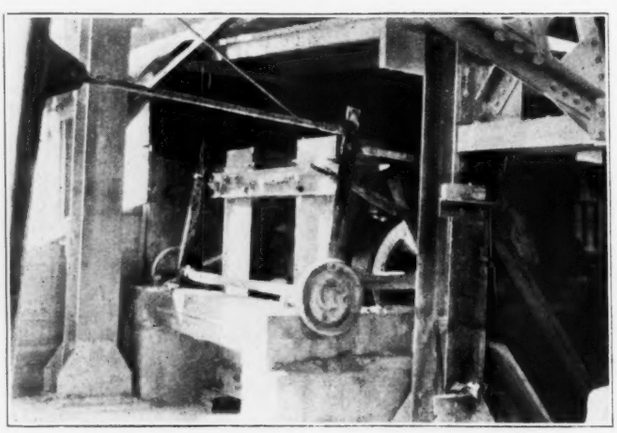
Referring again to the flow-sheet, it will be noted that the east elevator discharges to one dry screening unit, and the west elevator to two dry vibrating screen units. Classified dry material from these



Primary crusher discharging into surge bin. Pan conveyor from track-hopper is seen above.

two divisions can be sent to the washing plant or to bins as required. Both divisions of screens are connected by spouts to a third elevator which transports the materials to the washing plant.

Following the flow from the east elevator, the material comes into contact with another Allis-Chalmers double-deck vibrating screen, the top deck of which is equipped with a ¾-in.-mesh screen. This material is sent to a dry bin. If it is not wanted, it is chuted to a recrush bin which feeds a McCully 6-in. crusher for the production of finer grades of stone. The recrushing process forms the third unit of the secondary crushing system and will be described later. A ⅜-in.-mesh screen forms



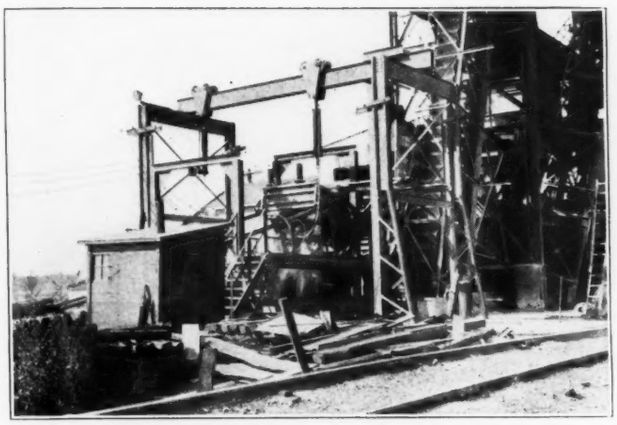
Double-drum friction hoist which pulls quarry cars.

the second deck of the unit, producing dry stone of this size which is sent to a bin or, if desired, it can be sent to the washing plant. Throughs from this deck go to the washing plant via the washing-plant elevator.

The dry classification of materials from the west elevator division is accomplished by two units which, placed one above the other, receive material from any of five sources, including the Symons crusher, the Newhouse crusher, the McCully crusher and two of the decks in the primary classifying process. The first unit has a 2½-in. top deck and a 1½-in. bottom deck. Materials produced on the two decks are sent either to dry bins or to a three-deck washing screen. The latter procedure is

unusual, inasmuch as, in most plants, provision is not generally made for washing the larger sizes of materials. Throughs from the 1½-in. screen fall to the top deck of the second unit, coming into contact with a ⅞-in.-mesh top deck followed by the ¾-in.-mesh bottom deck. Material produced on the top deck is sent either to the recrush bin or to the washing-screen elevator. Material produced on the second deck can be sent also to the recrush bin or to the washing screens.

Because of the increased demand for the smaller grades of stone for road construction purposes, provision has been made for recrushing some of the larger sizes of materials, in a McCully type 6-in. gyratory crusher set at ¾ in. and powered from a 40-hp. Allis-Chalmers motor with Texrope drive. A 65-hp. motor, however, is belted to the line-shaft, serving as a booster when the crusher is running. Material for the re-crushing process is taken from the top deck of a dry screen in the east elevator system, and from the top deck of the second unit in the west elevator system. No. 1 stone can be sent to the recrush from the top deck of the first screen in the west elevator system by means of a short belt conveyor. All crushed material from this process returns to the dry classifying screens via the west elevator.



An air hoist assists in placing large boulders into the primary crusher.

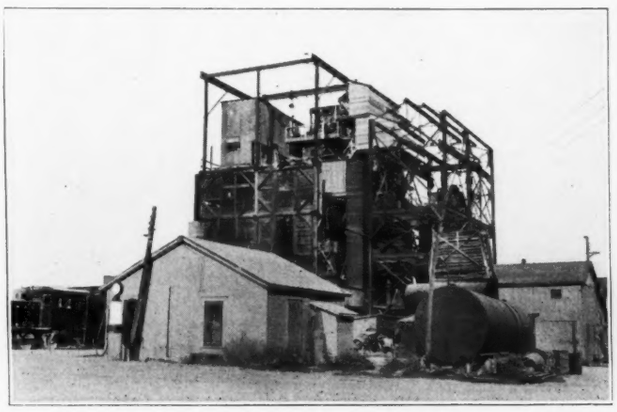
Seven of the 12 vibrating screens are employed to wash materials. Six of these units are installed in pairs, forming three levels, located in the new floors above the loading bins. The seventh unit has three decks, and is used to wash the No. 1 and No. 2 stone.

Material to be washed is sent to the six washing screens by means of a Webster 30-in. super-capacity elevator 34 ft. 6 in. long on centers. It is driven through back gears from an Allis-Chalmers 20-hp. squirrel-cage motor.

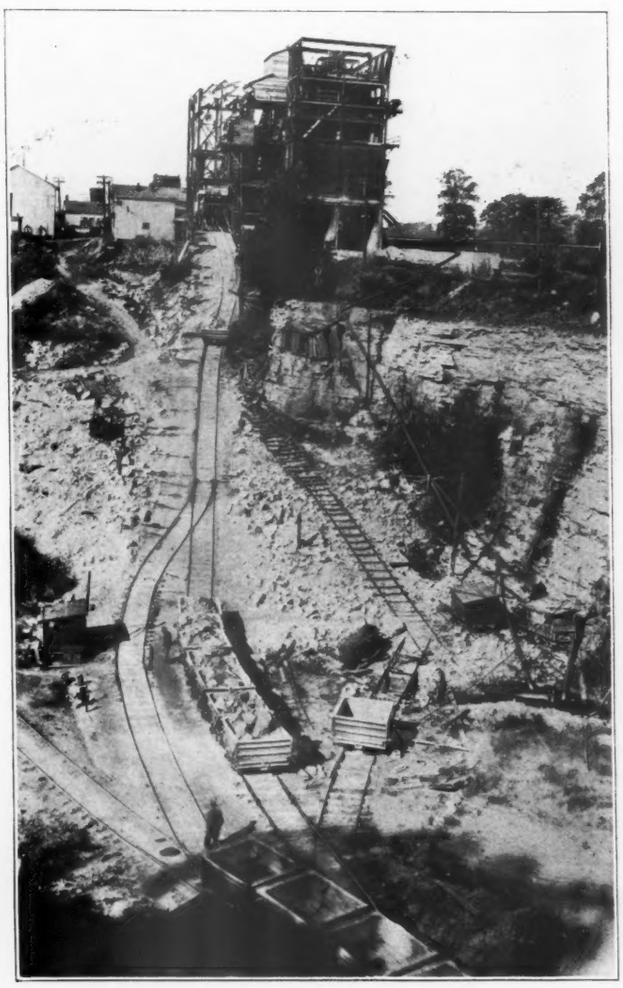
The first two parallel screens have 1-in.-mesh top decks, and ¾-in.-mesh bottom decks. Incidentally, all decks are installed with a 20-deg. slope. Concrete stone, 1-in. to 1½-in. in size, is produced on the top deck, and ¾-in. to 1-in. stone on the bottom decks. Throughs pass to the second set of parallel screens.

The top decks of the second set of parallel screens have ½-in. mesh and the bottom decks, ⅜-in. mesh. Materials produced are spouted to the loading bins. Throughs from the ⅜-in.-mesh decks fall to the top decks of the third set of parallel vibrating screens. The latter screens are equipped with ¼-in.-mesh top decks and ⅛-in.-mesh bottom decks.

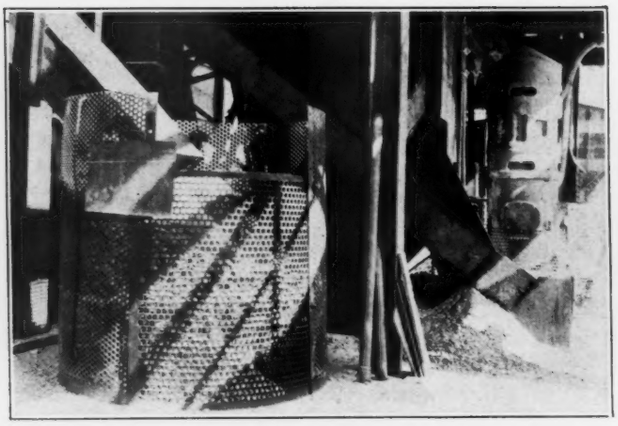
For washing the No. 1 and No. 2 stone, a single three-deck vibrating screen is employed. The material received on this screen has been sized by the



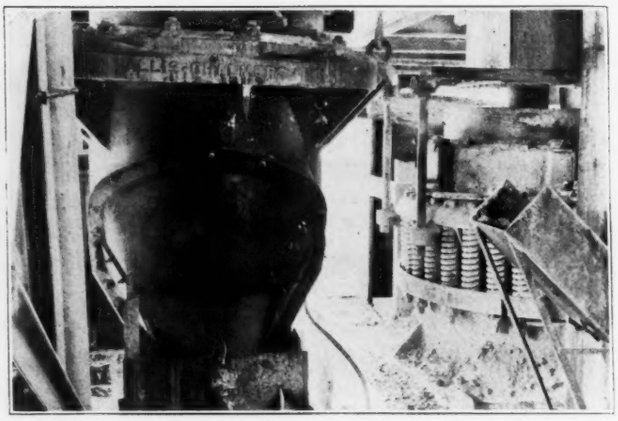
View of plant showing 12,000-gal. fuel-oil storage tank.



Incline from the quarry to crushing plant.



McCully crusher in foreground; Newhouse crusher, right.



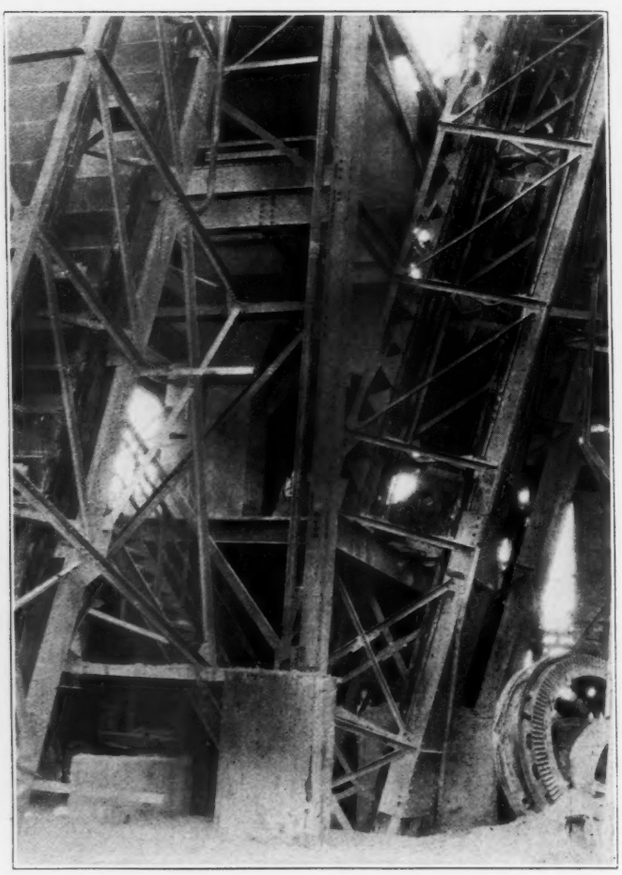
Newhouse crusher on left; cone crusher on right.

first screen unit on the west elevator system. Three decks are employed with meshes of 1¾-in., 1½-in., and ⅛-in. successively. The last deck is used to screen out washed fines from the stone above ⅛-in. size, before permitting the wash water to flow to the settling tank. The fines are returned to the 1½-in. to 2½-in. material produced on the second deck of this screen unit. This unit is not used unless order requirements call for washed No. 1 and No. 2 stone. It is driven by a 7½-hp. motor through an Allis-Chalmers Texrope drive.

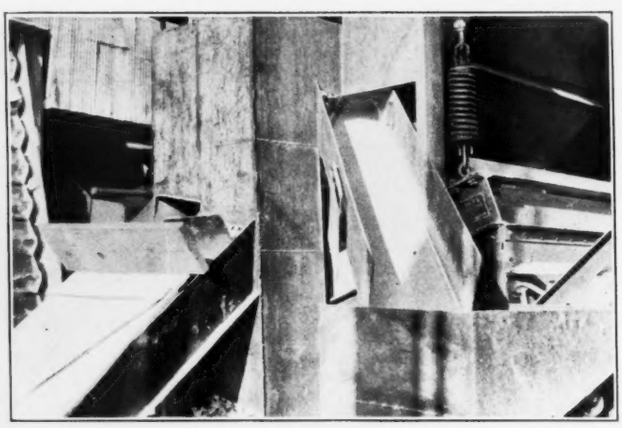
Each screen is equipped with three spray pipes, which are placed in action on the screens. The arrangement of the pipe jets and their water supply are discussed later.

All two-deck vibrating screens are driven by individual Allis-Chalmers 5-hp. motors through Texrope drives. Wash-water from the bottom decks of the vibrating screens is sent to a settling tank, as in a sand and gravel plant, to recover sand. In this case, the wash-water is heavily loaded with limestone below ⅛-in. in size. This material is in demand as a fine aggregate commonly used in cement-tile work and in concrete work.

Two settling tanks are used in recovering the fines, the first one being the larger with a length of 32 ft., while the second is 24 ft. long. The main



Scalping-screen elevator (left), and the two plant elevators.



Close-up view of welded chutes and downspouts.

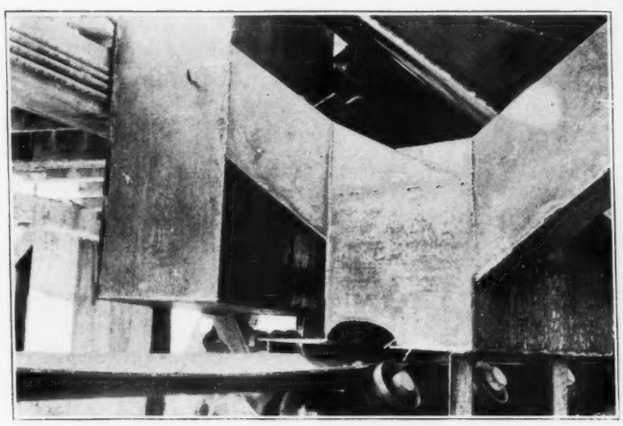
wash-water pipe is carried directly into the larger tank. A jet placed in the main pipe washes about one-half of the sand through another pipe into the second or smaller tank. The first tank is equipped with a Webster sand-drag equipped with 4-ft. paddles. It is driven by a 5-hp. slip-ring motor. The drag-chain has a clearance of 6 in. on both ends, allowing water to flow back down incline.

The second sand tank is of Morrow Mfg. Co., Wellston, O., manufacture. It has a drag-chain fitted with 24-in. paddles, 20 ft. long on centers and driven by a Fairbanks-Morse 5-hp. squirrel-cage motor.

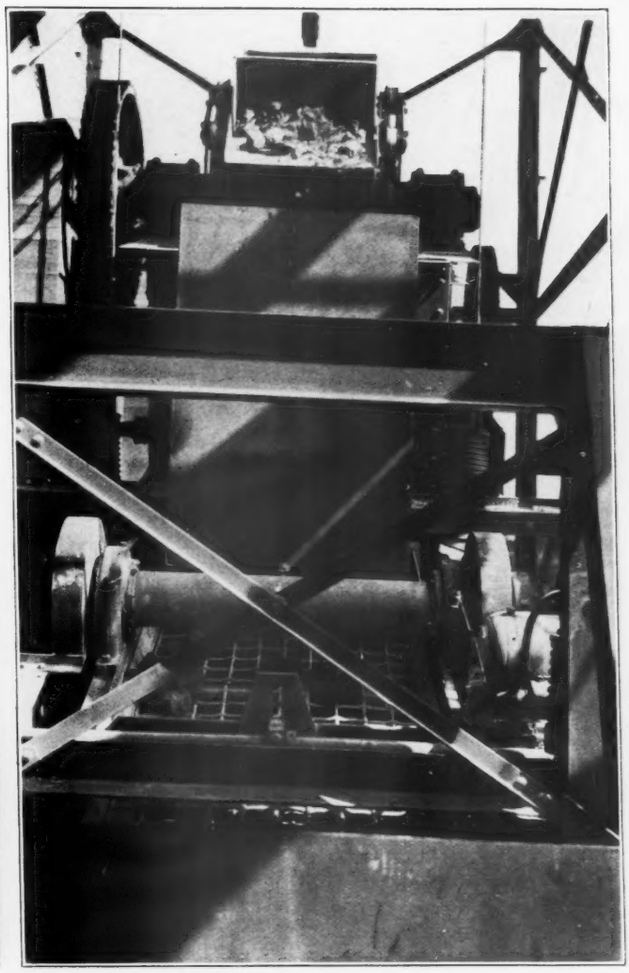
From the settling tanks the waste water flows into a large pond located over the prospective quarry operations described previously. Clear wa-

ter from the pond is returned to the creek to assist in conserving the available water supply. The fine material obtained from the sand drags is stored in a bin beneath.

The system of water supply and distribution is an example of excellent hydraulic engineering. A nearby creek furnishes fresh water to three centrifugal pumps mounted in a pump-house at its bank. Two Allis-Chalmers 2-stage, 3-in. by 4-in. centrifugal pumps, each driven by an Allis-Chalmers 40-hp. motor, deliver a total of 700 gal. per min. to the plant at a head of 255 ft. This rating is the equivalent of 110 lb. per sq. in. at the pump. Another pump, also located in the pump house, has a capacity of 200 gal. per min. at a 70-ft. head. It is a Fairbanks-Morse single-suction unit and supplies water for the engine house and other plant uses. This unit operates at a speed of 3,600 r.p.m. and is driven by a 10-hp. motor. In addition to these pumps, two more are located on the quarry floor, at the bank of a small sump. One pump is usually operated alone, with the other held in emergency.



Downspout and chute construction, showing conveyor-feeding box.

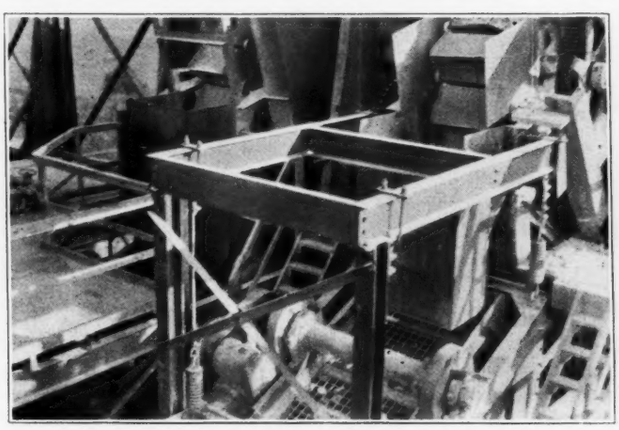


Primary scalping screen and vertical feeder chute.

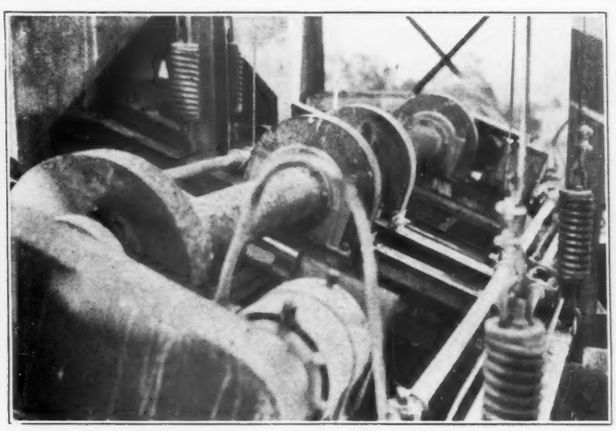
Both units are of Fairbanks-Morse manufacture. They are of the single-suction type, one having a capacity of 800 gal. per min., the other a capacity of 500 gal. per min. Water is pumped from the quarry floor to a booster sump located on the plant ground level. Thence it can be pumped directly to the plant system or it can flow to the creek.

A continuous-loop system is used in the pipe-line layout for the washing screens. An 8-in. pipe-line extends from the pump house at the creek to the plant, where two risers carry the water to two 6-in. headers on the top floor. An excellent pressure is therefore maintained on the top floor because no branch lines are taken off the risers. All screens on succeeding lower levels receive water from 4-in. lines extending from the main header.

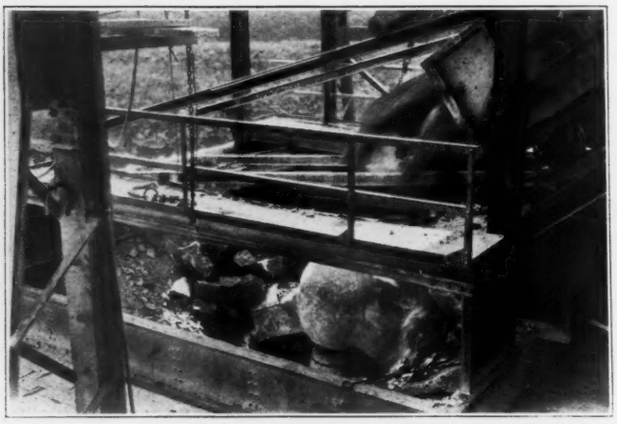
As explained, the washing screens are mounted



Elevators discharging to dry classifying screens.



First set of parallel washing screens. Note spray jets.



Car dumping to crusher. Note the structural steel enclosure about crusher.

in pairs on three levels. The jet pipes extend across each pair of parallel screens and receive water, at both ends, from the 4-in. lines extending from the header on the top floor. In other words, by feeding water to both ends of each jet pipe, the pressure is practically the same throughout because a dead end is eliminated and a uniform flow of water from all jets is effected. On each branch line, stopcocks are provided to cut out any pipe-line as required.

Some recently built plants have followed the example of industries by installing modern fire-protection equipment. The Beam company has taken advantage of the two 6-in. risers, which carry the water supply for the washing screens to the header on the top floor, utilizing them as standpipes. The risers are placed so that 75-ft. lengths of 1½-in. hose-lines, each equipped with an approved nozzle, can reach any portion of the floor levels upon which they are placed. Outlets on each riser are branched on several floor levels so that adequate protection is secured against fire.

Electrically-welded spouts and chutes are interesting features of this plant. In the opinion of many visitors, the Beam company has one of the best installations of this equipment in the country. All spouts and chutes are of steel plate cut to shape by oxy-acetylene torches, four sets of Imperial torches being kept on hand for this work. The steel-plate sections were placed in position and electrically welded. Two Una portable arc-welding machines are employed for this work and for general repair work as well. They convert 220-volt, 3-phase current to 20-volt direct-current for welding.

All chutes and downspouts are designed for a minimum of wear; in fact, almost every chute and downspout is protected by a stone lining or a stone-shielded baffle. Beginning with the vibrating screens, flumes below the lower decks of each unit are built low enough so that a man can crawl beneath to make any necessary repairs or inspections. From the various screen units, all flumes are pitched at an angle of 25 deg., this having been found the most suitable pitch for reducing the velocity of the flow of materials.

Special attention has been given to the design of the chutes that feed the vibrating-screen decks. Instead of permitting the material to strike the top deck on a horizontal plane, it is fed by a vertical spout having the width of the screen. A deflecting plate near the screen causes the material to be fed against the flow on the screen, preventing any rolling effect. This method tends to spread the material evenly, and insures screening effectiveness.

Materials from the upper levels of the plant are sent to lower levels or to bins by means of downspouts, built also of welded steel plate. In most cases, the downspouts are rectangular in cross-section with a longitudinal partition providing two spouts in one unit. This construction is economical and efficient as it eliminates a considerable amount of cutting of long strips of steel plate that would be required if single spouts were used. All downspouts terminate in a dead end. Numerous chutes lead from the vertical sides, each being equipped with a sliding gate to cut off the flow of material. The dead end of the spout fills with stone, and each chute branching from it fills up with stone to the gate. When materials are switched from one chute to another, it is necessary only to insert a gate in one chute and to take out another in the chute of the desired direction. Filling up with stone, the dead ends of the downspout and the unused chutes are protected against wear from falling material. In a downspout of considerable length, transverse steel baffle plates are inserted, which soon build up shoulders of stone to check the fall of the material.

Belt conveyors are fed from chutes through steel feeder boxes. The bottom of each box is a steel plate with a sufficient opening to feed the conveyor belt. Materials from a chute strike the sides and bottom of a box, soon building up a stone lining which eliminates wear of the box and reduces the velocity of the stone before it passes to the conveyor belt.

Twelve storage bins, each having a capacity of approximately 70 tons, provide storage and loading service for all grades of material including Nos. 1, 2, 34, 4, 6, 46, ⅜-in. and ⅛-in. concrete sand, and washed screenings. These bins are supported on heavy concrete piers which provide access for two sidetracks and, at the same time, roadways for truck loading.

The company, being located on the Baltimore & Ohio R. R., sufficient sidetrackage is available for 35 empty and 35 loaded cars. The Plymouth 30-ton gasoline locomotive spots the cars for loading and transfers the cars to scales and on the company tracks. Extensive piles of various materials and agstone are maintained to the west of the plant for the company's own storage and for the raw-material supply of an independently-owned asphalt plant adjacent to the Beam plant. As previously mentioned, an Industrial Brownhoist locomotive crane and four gondola cars handle the stock-pile material to and from the plant.

A frame building, adjacent to the plant, houses the two Fairbanks-Morse oil engines which power the crushing equipment and other mechanical equipment including a Worthington 8½-in. by 9-in. feather-valve air compressor. The latter is powered by a Fairbanks-Morse 30-hp. motor. The two Una electric welding machines are also located in this building.

Drilling for blast-holes.

Breaking up large pieces.

Loading train in the mine.

Soapstone and Talc Have Been Produced in Vermont for a Century*

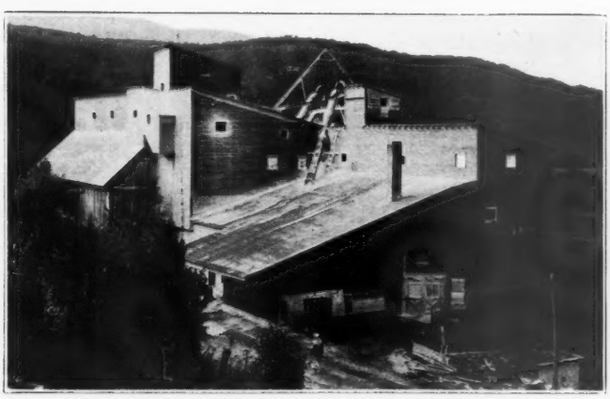
By A. S. TAYLOR

TALC! What is it? Such were the reactions of an attendant in a metropolitan library when asked recently for the latest data available there on the subject of talc mining and milling in the United States. If the public generally is not better informed than the attendant in that particular seat of accumulated human knowledge, then there is ample reason to tell something about American sources of this mineral and of the diversified ways in which it is used.

To the average person, the mention of talc instantly suggests talcum powder, now so widely employed as a toilet accessory. Talc suitable for the manufacture of talcum powder, however, represents but a very small percentage of the mineral annually produced the world over. The vast bulk of the talc mined is used in far more practical ways; and it enters, often without our knowledge, into the make-up of numerous things familiar to us by well-nigh daily use or contact. But before telling how talc is utilized more or less extensively, let us consider the origin of the mineral. In this instance, as in so many others, we see how Nature has provided man with a raw material—long neglected—which he now finds singularly adapted to a wide range of services.

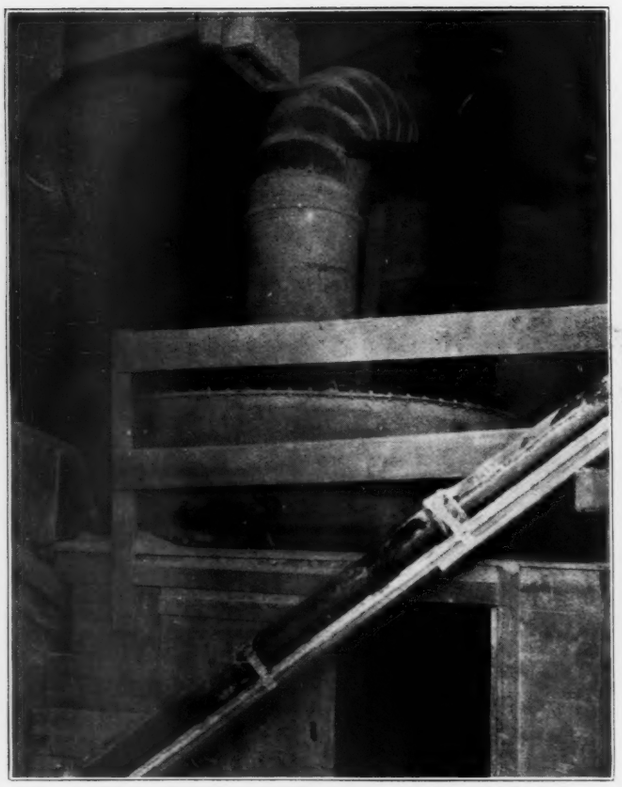
Talc is found in various parts of the world; but most of it is mined for economic reasons only within relatively easy reach of a market, this deciding whether or not a deposit of talc will be worth working. Talc and its mineralogical kin, soapstone, are produced in the greatest measure in the United States; and fully 65 per cent of the world output of these raw stuffs originates in this country. The latest figures issued by the U. S. Bureau of Mines emphasize the position held by Vermont in the industry; and one reason for this is that Vermont has the largest known reserves of these allied minerals among our producing states. Therefore we shall limit this article to an account of how talc is mined and milled at certain places in the Green Mountain State—the procedure there being typical of the latest practices in that field of industry.

The technicist will tell you that talc is a hydrous magnesium silicate, and that it is called talc only when the mineral is in the pure state. When found in the impure state and in the massive form it is usually designated as soapstone. Because talc and soapstone differ in composition and characteristics they are commonly used for dissimilar purposes. According to the geologist, talc is classified as a secondary mineral—that is, one that has come into being as a consequence of alterations that have taken place in original rocks that have contributed in varying degrees to the make-up of talc. The original rocks may have been either of sedimentary or igneous origin, or possibly both. Be this as it may, one thing is sure: a vast period of time has elapsed since the deposits of talc and soapstone were formed; and in many of the deposits are found fragmentary and cumulative evidences of some of the steps by which the transformation was wrought. The subject has provided a topic for much specula-



Johnson, Vt., plant, Eastern Magnesia Talc Co., Inc.

* Reprinted from *Compressed Air Magazine*, Oct., 1930.



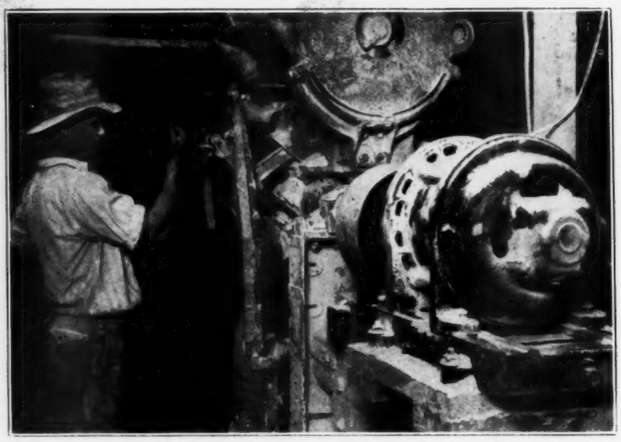
Tank between air separator and silos.

tion on the part of many prominent geologists.

The technicists are agreed that talc deposits are commonly lens-shaped masses standing more or less perpendicularly in the country rock that envelops them. The lenses are of irregular occurrence and differ greatly in their magnitude. Whatever may have been the primary source of the talc, it seems reasonably certain that the substance that brought about the successive changes had its origin deep in the bowels of the earth and was forced upward, at a high temperature, into existing cavities or into zones of weakness in the earth's crust. The alterations that took place subsequently were due to the combined actions of heat and pressure. In the end, when the talc lenses solidified, most of them were left with cores of talcose or grit. This grit, once classed as waste, is separated in the course of milling from the pure talc and now has commercial value.

Truck from mine discharging load to receiving bin at plant.

Talc and soapstone have been mined in Vermont for substantially a century. In the early days of the industry there, production was devoted principally to making slabs to serve as foot warmers and for allied purposes. Along about 1902, efforts were directed to grinding Vermont talc to make it fit for other uses, and since then the business has grown steadily and greatly. In 1905, for example, the output of talc in the state totaled 8,978 short tons but, by the end of the succeeding twelve years, production reached 93,960 short tons. Last year, one enterprise, the Eastern Magnesia Talc Co., Inc., mined and milled at Waterbury and Johnson, Vt., an aggregate of 50,000 tons of talc.



Automatic packer filling bags with talc.

From the massive pieces of its best talc, that company makes crayons for metal-workers—larger relatives of the soapstone slate pencils we used in our school days—while the fine stuff from the same grade of talc is sold to papermakers, to manufacturers of insulated wire, and to departments of the chemical industry. The middle grades go into rubber and into some of the cheaper kinds of paper; and what is classed as tailings—a coarse grade locally known as "grit," is utilized in the production of roofing paper. We might mention here that powdered talc and soapstone are employed in the dressing, coating, and dyeing of certain textiles; as a filler or pigment in some paints; as a foundry facing; as an ingredient in lubricants; in the manufacture of linoleum, oil cloth, and soap; in the glass industry; in special cements; in the making of imitation stone; and in candy and chewing-gum.

Because operations are on a bigger scale at Johnson, and the mill there is a really up-to-date plant, we shall confine ourselves to a description of that property of the Eastern Magnesia Talc Co. The mine from which the Johnson mill gets its raw material is about five miles distant, and motor trucks haul the talc from the mine to the mill. The main body of talc is now being worked from the sixth level, which extends from a shaft 300 ft. deep. The talc lies on the "black-wall"—as the flanking rock is called—with grit interposed between the east and the west walls. The deposit is 230 ft. wide on the

UNIVERSITY OF MICHIGAN LIBRARIES

sixth level and has been found to widen out as stoping proceeds upward. Indeed, it is authoritatively declared that the main orebody is a block of solid talc and grit at least 1,500 ft. long and from 200 to 250 ft. wide. The probable total tonnage of the deposit has been estimated to be about 4,250,000 tons. It is the largest single deposit so far discovered in Vermont. The orebody is a typical lens that strikes roughly northeast and dips from 55 degrees to 90 degrees westward. The lens is bounded by walls of serpentine; and there are veins of pure white talc from 1 to 30 ft. wide in contact with the walls. The core is the typical grit; and both talc and grit are of notably good quality and color.

The practice is to follow the vein in mining—using BCR-430 Jackhamers in drilling. When the mine was visited, operations were being carried on in a 12-ft. body; and eighteen holes, 6 ft. in depth, were drilled in a round. Where the heading is larger, as many as 24 holes are drilled in a round. In stoping, the holes range from 6 ft. to 12 ft. in depth. After shooting, the rock drops down the stope to a grizzly at the top of a chute, whence the ore descends into a bin from which it is fed successively into 1-ton mine cars. Large pieces are broken up with a paving breaker so that the talc will pass through the grizzly. Five cars constitute a train for the Mancha storage-battery locomotive which does the hauling. In the course of a 9-hr. day the output of the mine ranges between 100 and 150 tons.

The property has been worked for about seventeen years. The deposit was disclosed by a weathered outcrop near the present mine shaft and hoist house. The farmer who owned the land at the time was glad to part with it for $1,000 in cash.

Cloth-type dust collectors are used.

This screen separates the grit from talc.

The talc ore is raised to the surface in an electrically operated skip that dumps into bins at the mine head; and from these bins the mineral is loaded into motor trucks that transport it to the mill on the outskirts of Johnson. The mill is on a hillside in order to take advantage of gravity feed wherever possible. The ore is dumped from the trucks into a large hopper, on the upper side of the plant, and is then fed onto a table oscillated by an eccentric shaft. From the table the rock drops into a 15-in. by 24-in. Traylor jaw crusher, whence the ore is raised by a bucket elevator to a Walker-Elliott rotary crusher. From that crusher the talc goes onto a belt conveyor which carries it to the boot of an elevator that lifts it to the top of the mill, where it is run through a trommel.

The stuff that passes through the trommel descends by way of a chute to a smaller trommel, while the oversize drops back to the first floor to be handled by a smaller rotary crusher. The oversize from the small trommel, after passing through the small rotary crusher, goes either into the feed for the mill or into a storage bin for use later. The fine stuff that has passed through the first trommel is wet, and is conveyed to a drier bin and thence into a coke-fired cylindrical drier. After drying, the fine stuff is delivered to the same bin in which the dry

One of the roller mills.

Sawing talc into slabs preparatory to making crayons.

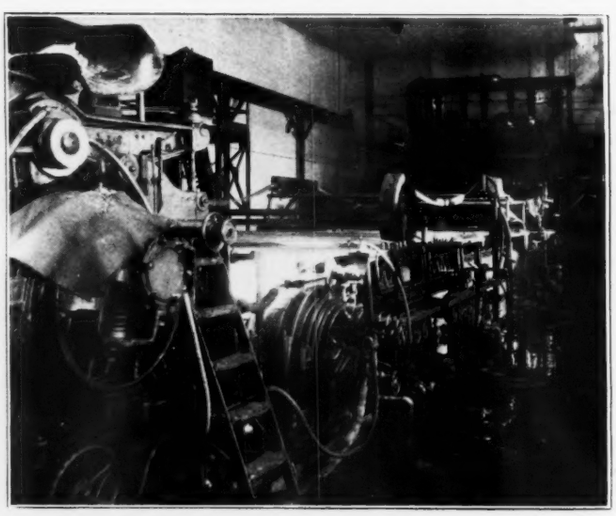
Making crayons from talc slabs on a dowel lathe.

oversize ore was placed previously. This bin is capable of holding about 350 tons of material.

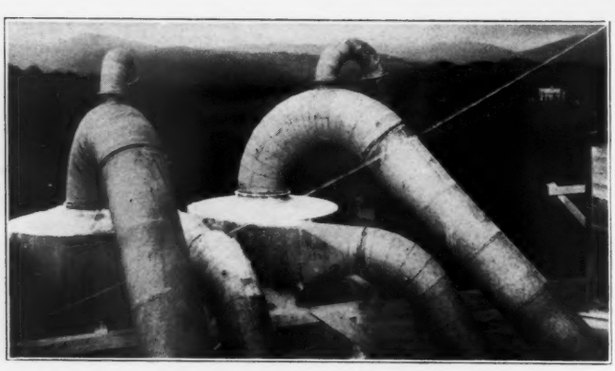
From the storage bin the ore is fed to a 30-in. buhr mill and also to a Hardinge mill, using imported Danish pebbles, which pulverizes it. After leaving the Hardinge mill the pulverized talc is carried to an air separator; the tailings from the separator are conveyed to a Raymond roller mill; and the fine stuff that rises from the air separator goes directly into silos. The material from the Raymond mill is also fed to an air separator. The fines are passed over a Tyler Hum-mer vibrating screen and the "throughs" are delivered to the silos.

Settling tanks are interposed between the air separators and the silos, and a worm or screw conveyor serves to move the deposited talc from a settling tank to any one of five of seven large silos. The two remaining silos receive grit which is marketed to roofing-paper manufacturers. The exhaust air passing from the separators to the settling tanks carries extremely fine particles of talc, and it is profitable to reclaim this floating material. This is effected by leading the dust-laden air into the tops of a series of fabric stockings or cloth tubes. The mesh of the fabric, while open enough to permit the escape of the air, is nevertheless fine enough to arrest the very minute particles of solid matter. It is interesting to recall that the air separators can be so regulated that they will separate particles of talc that have a difference in weight of less than one-thousandth of a milligram.

To insure the utmost separation and recovery of the very fine talc, the practice is to put the relatively coarse or rejected material from one air separator through a second air separator. The rejects obtained by this second treatment are transported by a screw conveyor to one or the other of the two silos reserved for grit or tailings. This grit carries a percentage of fine talc—the by-product of the milling operations that is sold to manufacturers of roofing paper. The tailings are sized through screens before they are discharged into the bins just mentioned; and the oversize is conveyed to a service or storage bin from which it is ultimately withdrawn and subjected to regrinding.



Paper-making machine in a Canadian mill.



Upper ends of two air separators at the Johnson plant.

A talc mill is an exceedingly dusty place despite the exercise of every precaution to reduce this as far as possible. At the Johnson mill, all machinery is electrically operated, and the plant, therefore, contains numerous motors that have to be blown

(*Continued on page 48*)

Effect of Grading of Gravel and Sand on Voids and Weights—Part II*

By STANTON WALKER and C. E. PROUDLEY

VOIDS and unit weights of combinations of sand and coarse aggregate are required to make the information in the preceding paper complete. (PIT AND QUARRY, Nov. 19, 1930.) Data on mixtures of the two sands and one gravel described in that paper are not available and it has been considered desirable to supplement the information on separated materials with the results of tests on mixed materials carried at the Structural Materials Research Laboratory, Lewis Institute, Chicago. Acknowledgment is made to F. R. McMillan, Director of Research of the Portland Cement Assn., for the release of these hitherto unpublished data for this purpose.

Scope of Tests

Unit weight determinations were made on combinations of sand and coarse aggregate ranging from 0 per cent to 100 per cent sand. Four different sizes of sand were used as follows: 0 to No. 28, 0 to No. 14, 0 to No. 8, and 0 to No. 4. Three different coarse aggregates were used in the investigation—granite, slag and gravel. Only the data for the granite and the gravel are included in this appendix; the granite being selected as typical of an angular coarse aggregate and the gravel as typical of a rounded one. Tests were made with five different gradings of coarse aggregates as follows: No. 4 to ⅜-in., No. 4 to ¾-in., No. 4 to 1½-in., ⅜-in. to ¾-in., ¾-in. to 1½-in.

The sand and gravel were from Elgin, Ill.; the granite from Wisconsin. The unit weights were determined for the materials in a dry and rodded condition; the tests were made in accordance with the standard method of the American Society for Testing Materials, described in the preceding paper.

The unit weights are given in Tables VI and VII. The relations between voids and the ratio of sand to coarse aggregate for the various gradings are shown in Figs. 4 to 7. The voids were computed from the weights per cubic foot by the use of Equation 1, outlined in the preceding paper.

Test Results

Fig. 4 shows the percentage of voids for various combinations of sand and gravel. In general, the addition of sand of different sizes had about the same effect on the voids up to the amount which produces minimum voids. Beyond this point, the coarser sands, or those with the least voids, produced combined aggregates of a lower void content than the finer sands. In general, the minimum void content for the combined aggregates was produced with combinations containing 35 to 45 per cent sand.

* Reprinted from *National Sand and Gravel Bulletin*, Oct. 15,

TABLE VI. UNIT WEIGHTS OF MIXTURES OF SAND AND GRAVEL

Weights determined in ⅓-cu. ft. measure.
Aggregates: Sand and gravel from Elgin, Ill.
Data from investigations of Structural Materials Research Laboratory, Lewis Institute, Chicago (Series 48).

Size of Aggregate		Weight of Aggregate for Different Percentages of Sand (*lb. per cu. ft.*)										
Fine	Coarse	0	10	20	30	40	50	60	70	80	90	100
0-28	⅜–¾	105	113	119	121	124	122	120	115	111	108	105
	¾–1½	109	116	121	130	129	124	120	116	112	106	105
	⅜–1½	111	.....	129	.....	132	.....	121	.....	112	.....	105
	⅜–¾	105	.....	124	.....	130	.....	121	.....	112	.....	105
	¾–1½	105	.....	124	.....	129	.....	126	.....	117	.....	105
		Av. 107	.....	123	.....	129	.....	122	.....	113	.....	105
0-14	⅜–¾	105	111	117	122	124	124	121	117	114	111	107
	¾–1½	109	117	122	129	128	126	123	117	114	109	107
	⅜–1½	111	.....	126	.....	132	.....	130	.....	115	.....	107
	⅜–¾	105	.....	121	.....	129	.....	124	.....	115	.....	107
	¾–1½	105	.....	125	.....	132	.....	125	.....	116	.....	107
		Av. 107	.....	122	.....	129	.....	125	.....	115	.....	107
0-8	⅜–¾	105	111	119	121	123	122	122	118	117	111	109
	¾–1½	109	118	123	127	128	127	127	119	117	113	109
	⅜–1½	111	.....	126	.....	131	.....	125	.....	117	.....	109
	⅜–¾	105	.....	122	.....	129	.....	126	.....	116	.....	109
	¾–1½	105	.....	125	.....	132	.....	128	.....	123	.....	109
		Av. 107	.....	123	.....	129	.....	125	.....	118	118	109
0-4	⅜–¾	105	111	115	118	121	123	120	119	119	117	115
	¾–1½	109	117	121	126	130	127	125	124	120	119	115
	⅜–1½	111	.....	123	.....	130	.....	127	.....	126	.....	115
	⅜–¾	105	.....	122	.....	128	.....	126	.....	124	.....	115
	¾–1½	105	.....	121	.....	135	.....	132	.....	125	.....	115
		Av. 107	.....	120	.....	129	.....	126	.....	123	.....	115

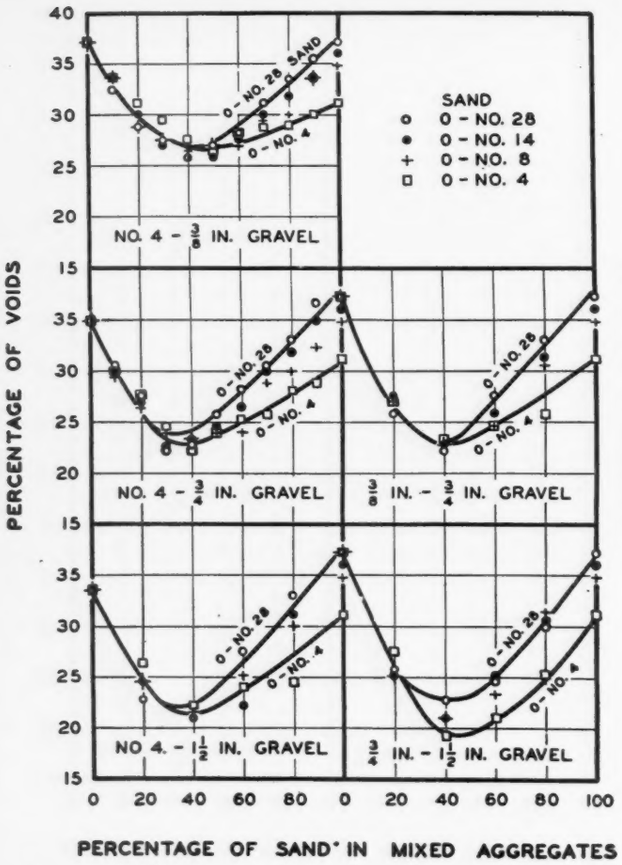

PERCENTAGE OF VOIDS
SAND
o 0 - NO. 28
• 0 - NO. 14
+ 0 - NO. 8
□ 0 - NO. 4
NO. 4 - 3/8 IN. GRAVEL
NO. 4 - 3/4 IN. GRAVEL
3/8 IN. - 3/4 IN. GRAVEL
NO. 4 - 1 1/2 IN. GRAVEL
3/4 IN. - 1 1/2 IN. GRAVEL
PERCENTAGE OF SAND IN MIXED AGGREGATES

Fig. 4. Void contents of combinations of sand and gravel.

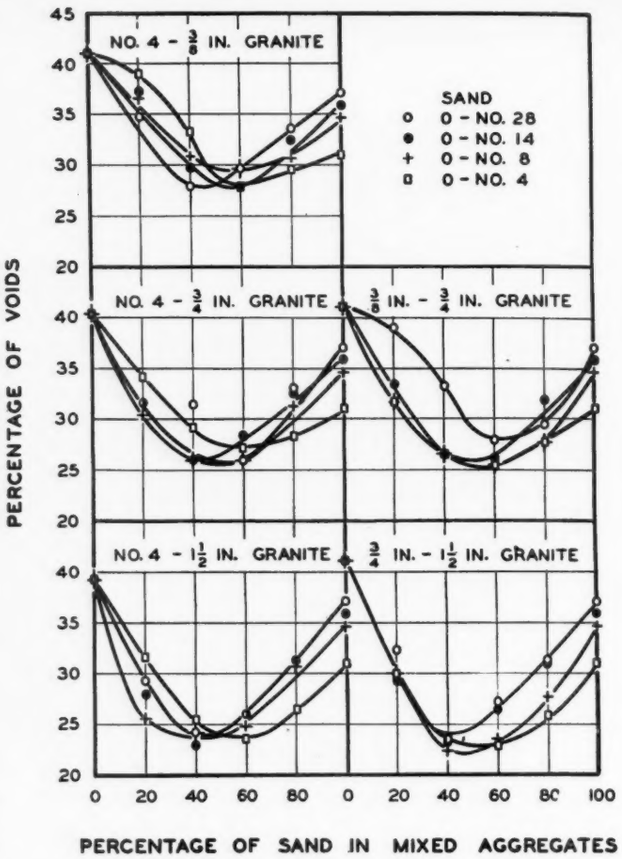

PERCENTAGE OF VOIDS
SAND
o 0 - NO. 28
• 0 - NO. 14
+ 0 - NO. 8
□ 0 - NO. 4
NO. 4 - 3/8 IN. GRANITE
NO. 4 - 3/4 IN. GRANITE
3/8 IN. - 3/4 IN. GRANITE
NO. 4 - 1 1/2 IN. GRANITE
3/4 IN. - 1 1/2 IN. GRANITE
PERCENTAGE OF SAND IN MIXED AGGREGATES

Fig. 5. Void contents of sand and crushed granite.

The coarser gravels produced combinations of lower void contents than the finer gravels.

Fig. 5 shows similar data for combinations of sand and granite. The relations are not as regular as for the sand-and-gravel mixtures and the different sands affected the voids differently throughout the entire range. Beyond the percentage of sand producing minimum voids, in general, lower void contents were obtained with the coarser sands than with the finer ones.

Fig. 6 gives the average results for the same data as shown in Fig. 4. The group of curves at the top of the diagram shows the effect of the grading of sand on the void content of the combined

TABLE VII. UNIT WEIGHTS OF MIXTURES OF SAND AND CRUSHED GRANITE
Weights determined in ⅓-cu. ft. measure.
Aggregates: Sand from Elgin, Ill. and crushed granite from Wisconsin.
Data from investigations of Structural Materials Laboratory, Lewis Institute, Chicago (Series 48).

Size of Aggregate		Weight of Aggregate for Different Percentages of Sand (*lb. per cu. ft.*)										
Sand	Granite	0	10	20	30	40	50	60	70	80	90	100
0-28	4–3/8	96	.....	107	.....	119	.....	116	.....	110	.....	105
	4–3/4	97	.....	112	.....	113	.....	122	.....	111	.....	105
	4–1½	99	.....	116	.....	125	.....	122	.....	114	.....	105
	3/8–3/4	96	.....	100	.....	110	.....	119	.....	117	.....	105
	3/4–1½	96	.....	111	.....	126	.....	120	.....	114	.....	105
		Av. 97	.....	109	.....	119	.....	120	.....	113	.....	105
0-14	4–3/8	96	.....	103	.....	116	.....	119	.....	112	.....	107
	4–3/4	97	.....	112	.....	122	.....	118	.....	112	.....	107
	4–1½	99	.....	118	.....	127	.....	122	.....	114	.....	107
	3/8–3/4	96	.....	109	.....	121	.....	122	.....	113	.....	107
	3/4–1½	96	.....	116	.....	126.5	.....	121.5	.....	114.5	.....	107
		Av. 97	.....	112	.....	122.5	.....	120.5	.....	113.1	.....	107
0-8	4–3/8	96	.....	104	.....	114	.....	116	.....	115	.....	109
	4–3/4	97	.....	114	.....	122	.....	122	.....	114	.....	109
	4–1½	99	.....	122	.....	125	.....	124	.....	115	.....	109
	3/8–3/4	96	.....	112	.....	121	.....	123	.....	120	.....	109
	3/4–1½	96	.....	115	.....	128	.....	126	.....	120	.....	109
		Av. 97	.....	113	.....	122	.....	122	.....	117	.....	109
0-4	4–3/8	96	.....	100	.....	110	.....	119	.....	117	.....	115
	4–3/4	97	.....	108	.....	117	.....	120	.....	119	.....	115
	4–1½	99	.....	112	.....	123	.....	126	.....	122	.....	115
	3/8–3/4	96	.....	112	.....	121	.....	123	.....	120	.....	115
	3/4–1½	96	.....	115	.....	126	.....	127	.....	123	.....	115
		Avg. 97		109		119		123		120		115

aggregate. Each point represents the average of the results for the five gradings of gravel. In the lower portion of the diagram, values are averaged in such a way as to show the effect of grading the coarse aggregate on the void content of the combinations. Each point represents the average of the values for all of the sands tested. Fig. 7 presents a similar study of the combinations of sand and granite.

Indications of Test Results

The complete significance of the test results cannot be considered without taking into account the effect of the voids on whatever finished product utilizes the mixtures of fine and coarse material. The following indications of the relationships between grading and voids seem clear from the data and should be of interest:

1. For quantities of sand greater than required to produce minimum voids the mixtures containing the coarser sand produced the lower void contents.

2. The coarser sands used in this investigation had lower void contents than the finer ones.

3. For gravel as the coarse aggregate, the same percentage of sand produced minimum voids, regardless of the grading of the sand; the minimum voids obtained with a given grading of gravel was the same for the different gradings of sand.

4. For granite as the coarse aggregate, the percentage of sand required to produce minimum voids varied as the grading of the sand varied; there is, however, no indication of a definite relationship.

5. The percentage of minimum voids for each combination varied with the grading of the coarse aggregate. The larger-sized, coarse aggregates gave the lower void contents for mixtures of sand and coarse aggregate. This relationship seems to be a function of size of particle and, probably, of size of void spaces rather than percentage of voids in the coarse aggregate.

Free moisture in fine aggregate causes a phenomenon known as bulking. Bulking has been the cause of considerable difficulty in the form of undersanded mixes and over-run in cement when volumetric proportioning did not take it into account. Weight pro-

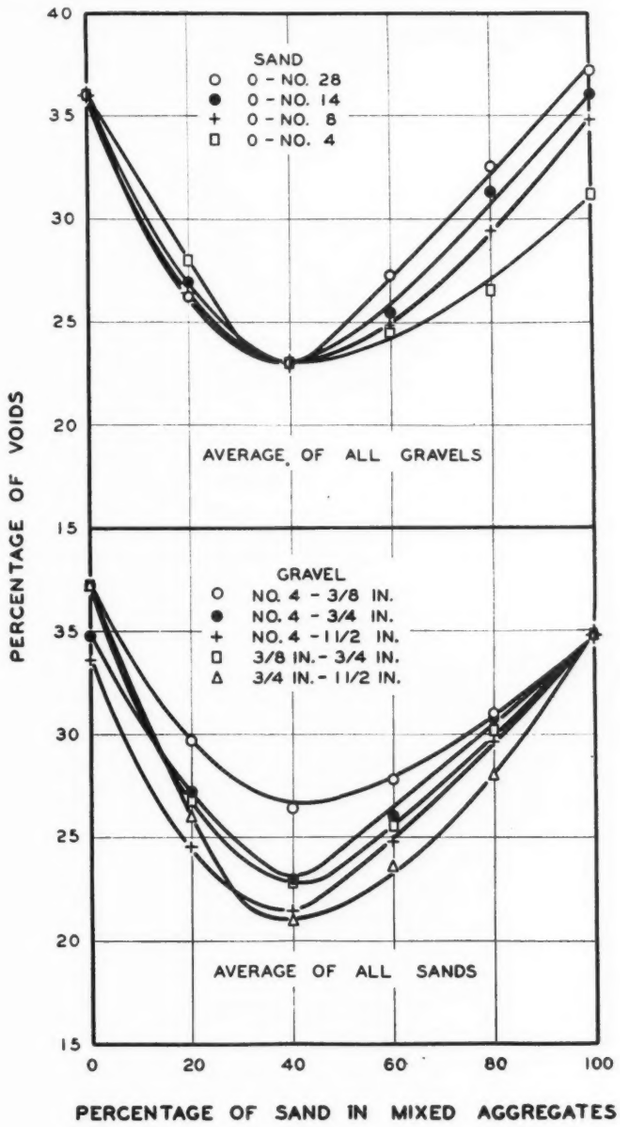

SAND
O 0 - NO. 28
● 0 - NO. 14
+ 0 - NO. 8
□ 0 - NO. 4
AVERAGE OF ALL GRAVELS
GRAVEL
O NO. 4 - 3/8 IN.
● NO. 4 - 3/4 IN.
+ NO. 4 - 1 1/2 IN.
□ 3/8 IN. - 3/4 IN.
△ 3/4 IN. - 1 1/2 IN.
AVERAGE OF ALL SANDS
PERCENTAGE OF VOIDS
PERCENTAGE OF SAND IN MIXED AGGREGATES

Fig. 6. Averages of data from Table VI and Fig. 4.

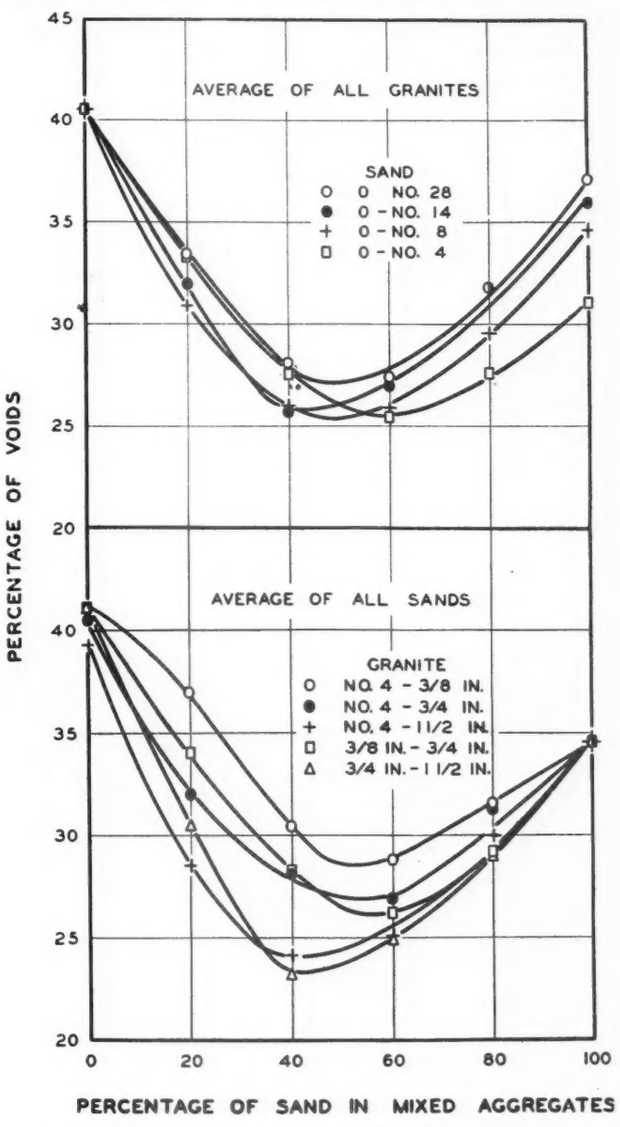

AVERAGE OF ALL GRANITES
SAND
O 0 NO. 28
● 0 - NO. 14
+ 0 - NO. 8
□ 0 - NO. 4
AVERAGE OF ALL SANDS
GRANITE
O NO. 4 - 3/8 IN.
● NO. 4 - 3/4 IN.
+ NO. 4 - 1 1/2 IN.
□ 3/8 IN. - 3/4 IN.
△ 3/4 IN. - 1 1/2 IN.
PERCENTAGE OF VOIDS
PERCENTAGE OF SAND IN MIXED AGGREGATES

Fig. 7. Averages of data from Table VII and Fig. 5.

TABLE VIII. SIEVE ANALYSES OF SANDS USED FOR BULKING TESTS AT LEWIS INSTITUTE

Data from "Discussion on Measurements of Sand" by Stanton Walker, Proc. 1923, Amer. Concrete Institute.
Bulking characteristics are shown in Fig. 8.

Sieve No.	Size of Opening (*sq. in.*)	Sieve, Per Cent by Weight Amount Coarser Than Each		
		Fine	Medium	Coarse
100	0.0058	96	98	98
50	0.0116	66	83	84
30	0.0232	1	48	52
16	0.046	0	28	36
8	0.093	0	0	15
4	0.185	0	0	1
Fineness Modulus.....		1.63	2.57	2.86

portioning has overcome much of the difficulty attendant on the use of moist aggregates but, where volume batching is used, it is of great importance that the bulking characteristics of the sand be known.

Several investigators who have made tests, report maximum values ranging from 7 to 48 per cent, depending upon the grading of the sand, percentage of free moisture and method of determination. No fundamental relations have been established but, in general, it has been found that the maximum effect is obtained with 3 to 10 per cent moisture and that greater bulking occurs with fine sand than with coarse sand.

Correspondingly large changes in the voids in the sand occur with bulking. In some tests made in the Structural Materials Research Laboratory of Lewis Institute one method of measurement showed 59 per cent voids in a bulked sample of fine sand which had only 40 per cent voids when measured in a dry and rodded condition. The details of these data are given in Fig. 8 and Table VIII. Fig. 8 shows some curves for percentage of bulking, unit weight and voids. Three gradings of sand, coarse, medium and

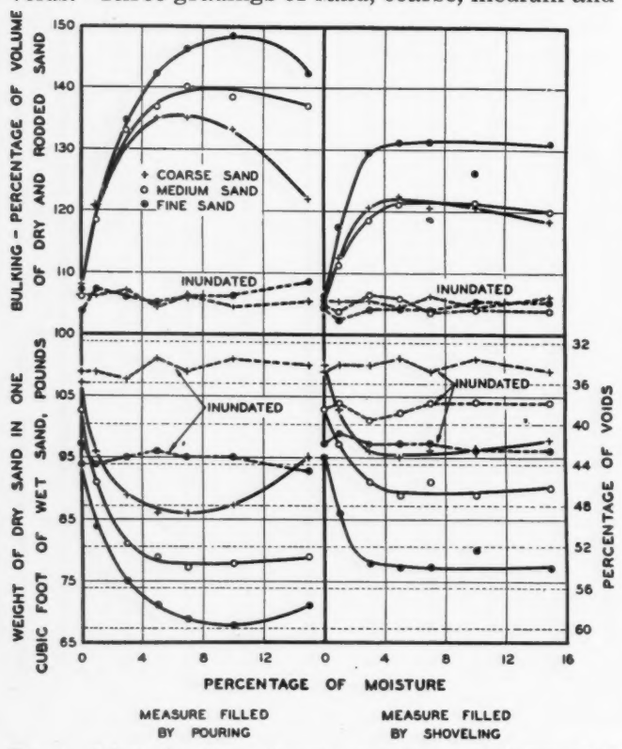

BULKING - PERCENTAGE OF VOLUME OF DRY AND RODDED SAND
WEIGHT OF DRY SAND IN ONE CUBIC FOOT OF WET SAND, POUNDS
PERCENTAGE OF VOIDS
COARSE SAND
MEDIUM SAND
FINE SAND
INUNDATED
PERCENTAGE OF MOISTURE
MEASURE FILLED BY POURING
MEASURE FILLED BY SHOVELING

Fig. 8. Effect of moisture in sand on volume, weight per cubic foot, and voids.

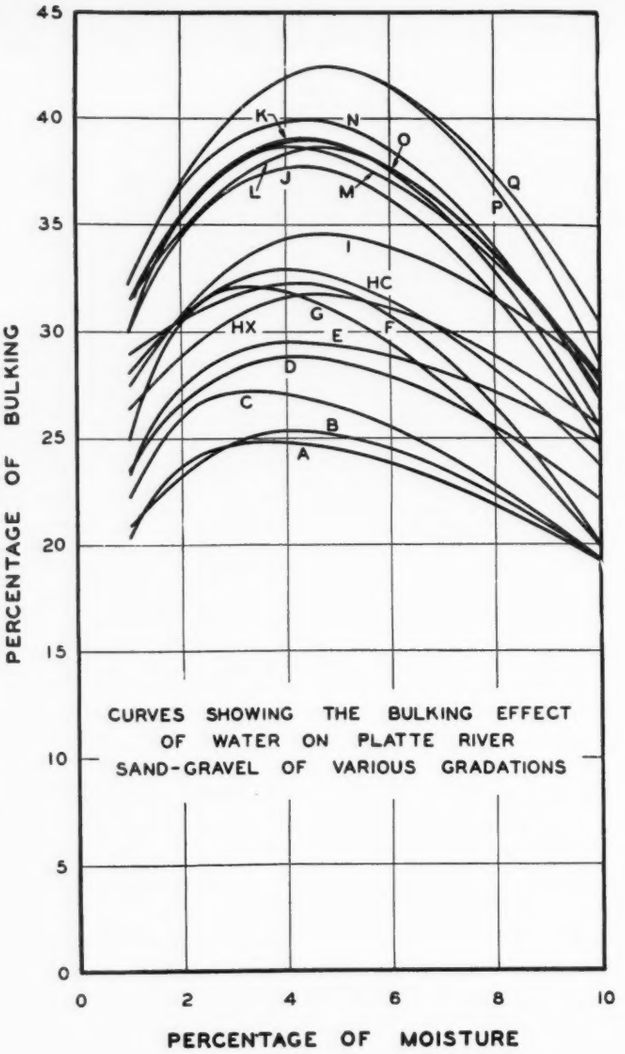


Fig. 9. Percentage of bulking due to moisture.

fine, were used, the analyses for which are shown in Table VIII. A 1½-cu. ft. measure was filled by two methods: (1) by pouring the sand in a steady stream, and (2) by shoveling into the measure with a small hand scoop. The effect of inundation on the volume occupied by the sand is also shown.

A more extensive study of bulking was carried out by the Kansas State Highway Laboratory on a number of coarsely graded sands. The bulking curves are shown in Fig. 9 and the grading in Table IX. This group of tests is especially interesting in showing the effect of gradation on the percentage of bulking. In Fig. 10 the sands have been plotted on triangular coördinates and the maximum percentage of bulking marked for each point. The gradings are finer for points to the right and toward the top. Some smooth contours have been drawn on the diagram which illustrate, in a general way, the relationship between maximum bulking of sand and its grading.

The method for determining bulking in the Kansas tests was similar to that used in some tests at the U. S. Bureau of Public Roads. A standard slump cone was supported in an inverted position so that its bottom was 12 in. above the top of a

½-cu. ft. measure. Starting with dry sand, successive tests were made, adding water in increments of about one per cent by weight of the dry sand. The prepared sand was poured through the cone into the container until it overflowed. The excess was struck off and the measure of sand weighed without tamping.

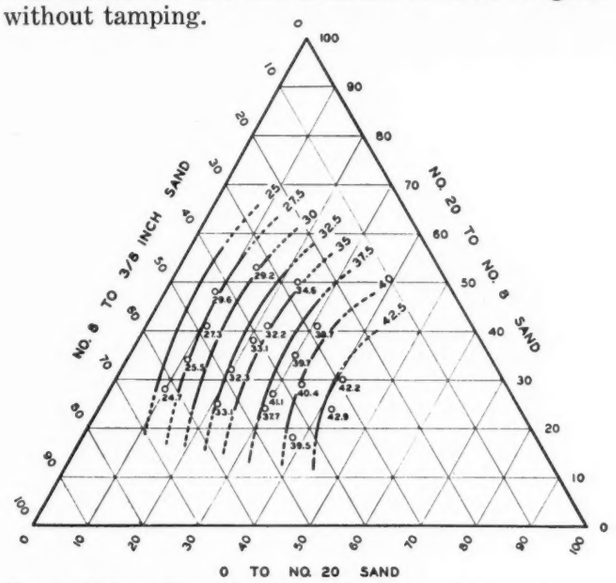


Fig. 10. Effect of grading of aggregate on maximum percentage of bulking.

The results of the Bureau of Public Roads tests are shown in Fig. 11. The fineness moduli of the sands were about 3.80 for sand C, 2.65 for sand M, and 1.55 for sand F. In the case of sands C and F sufficient water could be added to bring the percentage of bulking back to zero with the method of determination used. This condition is practically that of inundation.

In the Lewis Institute tests the inundated condition was obtained by introducing the sands into the measure which had been previously half-filled with water. When measured in this manner, the presence of surface moisture has practically no effect on the volume of sand as is shown by the practically horizontal dotted lines for the inundated condition in Fig. 8. This is approximately the same value as

PERCENTAGES RETAINED ON STANDARD SIEVES	SAND "C" POTOMAC RIVER CONCRETE SAND	SAND "M" ALLEGHENY RIVER CONCRETE SAND	SAND "F" POTOMAC RIVER ASPHALT SAND
¼ INCH	1	0	0
NO 10	48	13	1
NO 20	70	24	7
NO 30	79	48	19
NO 40	83	68	31
NO 50	88	89	49
NO 80	93	97	70
NO 100	95	98	82
NO 200	97	99	92
PASSING NO 200	3	08	8

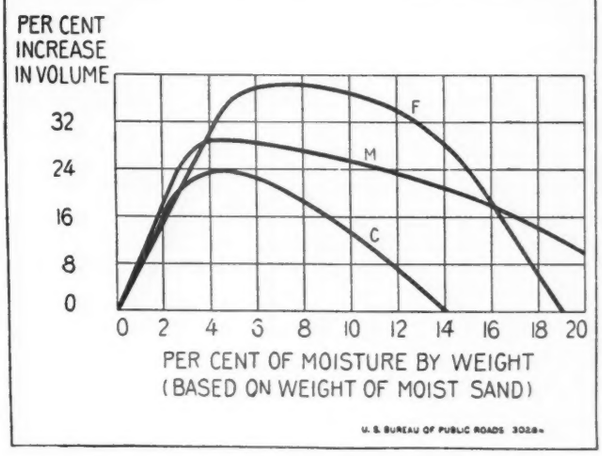


Fig. 11. Bulking of three different sands due to varying percentages of moisture.

that obtained for sand measured in a dry and loose condition. Inundation measurement has been put to practical use in the proportioning of concrete as described by R. L. Bertin before the 1922 convention of the American Society for Testing Materials.

TABLE IX. SIEVE ANALYSES OF AGGREGATES USED FOR BULKING TESTS AT THE KANSAS STATE HIGHWAY LABORATORY

Data from "Effect of Gradation on Bulking of Sand and Gravel" by Harold Allen, *Cement, Mill & Quarry*, April 5, 1927.
Bulking characteristics are shown in Fig. 9. Each analysis is the average of three tests.

Identification	Amounts Coarser Than Each Sieve (*per cent by weight*)										Fineness Modulus
	100	48	28	20	14	10	8	4	⅜	¾	
A	100	97	93	90	90	87	62	20	5	.....	4.67
B	100	97	92	89	83	77	55	19	5	.....	4.51
C	100	97	92	89	79	68	48	16	3	.....	4.35
D	100	98	94	91	77	59	43	16	3	.....	4.31
E	99	97	91	86	69	49	33	12	1	.....	4.02
F	99	93	84	79	79	77	54	19	4	.....	4.32
G	99	94	85	80	75	68	48	16	3	1	4.21
HC	99	93	84	79	69	58	41	13	4	1	4.04
HX	99	94	86	78	66	49	37	14	4	1	4.01
I	99	94	85	77	60	39	27	9	2	.....	3.76
J	99	91	77	70	70	66	46	16	3	1	4.03
K	100	90	76	70	65	58	43	14	3	.....	3.91
L	100	92	78	70	60	49	35	12	4	.....	3.81
M	99	91	76	69	55	39	28	9	2	.....	3.60
N	99	90	74	66	58	49	37	13	3	.....	3.74
O	97	86	72	62	62	59	44	17	5	.....	3.83
P	98	82	70	58	53	46	34	11	3	.....	3.51
Q	99	87	71	59	51	38	29	10	2	.....	3.49

Conclusions

From a study of the investigations referred to, the following conclusions may be stated:

1. Sands increase in bulk when moist. The amount of bulking depends upon the percentage of moisture and the method of measurement. Bulking is accompanied by an increase in the percentage of voids.

2. Maximum bulking is obtained with 3 to 10 per cent moisture, depending on the grading of the sand. Finer sands require more moisture to produce maximum bulking than do coarse sands.

3. Fine sands bulk more than coarse sands. For the usual conditions (3 to 6 per cent moisture) 20 to 45 per cent bulking may be expected, depending on the grading of the sand and the method of measurement.

4. Bulking is not a factor in the measurement of sand by weight. Weight measurements, however, should take into account the weight of water present at the time of weighing.

5. Inundation minimizes the bulking of moist sand and gives a value approximately equal to that of the sand measured in a dry and loose condition.

Demand for Sand From New Plant Proves Wisdom of Preliminary Survey

Producer Studied Market Opportunities in His Area Before Deciding to Build

EARLY this past summer, the Consumers Sand Co. of New Castle, Pa., after a thorough investigation of the market opportunities in the immediate territory, constructed a modern sand plant. Prior to the time this plant went into production, the major demands for sand and gravel had been filled by producers in the Pittsburgh district to the south. Since this new plant started operation in August it has been running on a full-time schedule and the outlook is reported good for continued business.

A. E. Rhodes, of Youngstown, O., is president; W. W. Wallace, of New Castle, is treasurer; and William Pitzer is superintendent.

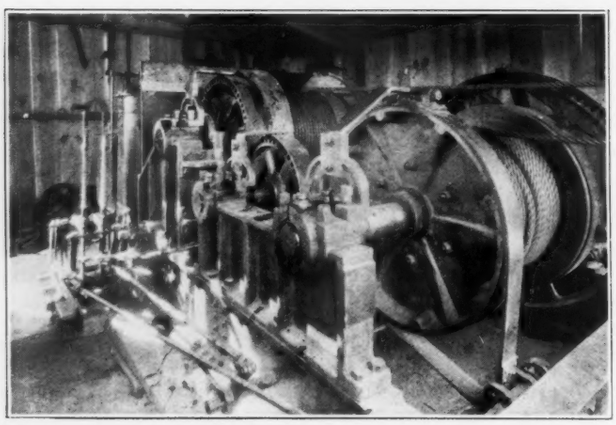
The company's deposit of sand and gravel constitutes a knoll, the top of which is about 190 ft. above the bed of a river. To Leslie Wilson, an engineer of wide experience in the stone-crushing plants, was assigned the design of this plant. He concluded to take advantage of a ravine which, with little grading, could be utilized as the bed for tracks to connect with the main lines of railroads in the valley. This line was laid with double trackage at the loading bins.

Screening plant and bins from the railroad.

View of the plant; grizzly above field hopper at right.

The material is excavated and moved from the pit to the plant with a 2½-cu. yd. drag-scraper powered by an electric drag-scraper hoist Type LJ, these equipments being manufactured by Street Bros. Machine Works, Chattanooga, Tenn. The motor for the hoist is a General Electric 100-hp., Type MTC, and has a drum-type controller and resistor. The ropes and the fair-lead head-sheaves and tail-blocks also were furnished by Street Bros.

The hoist is erected within a small frame building a few feet to one side of the scraper's line of travel and near the field hopper. The engineer has a clear view of the bucket during its travel.



Drag-scraper hoist at Consumers plant.

The hopper is 14 ft. square covered by a heavy grizzly for the rejection of occasional oversize stones. A plate-feeder beneath the hopper is operated by a sprocket-chain drive from the lower shaft of the conveyor which it feeds. The conveyor is 18 in. wide and 106 ft. long. The idlers are Stephens-Adamson No. 60 and the belt was furnished by the Voorhees Rubber Mfg. Co., Jersey City, N. J. The conveyor delivers the material into three Link-Belt 63-in. by 31½-in. by 84-in. conical screens which are driven by a Crocker-Wheeler 25-hp. motor.

Only two sizes of gravel are prepared, all material under ⅜-in. being regarded as sand which is sep-

(*Continued on page 48*)

Occurrences, Production and Marketing of Spars in Canada's Provinces

Barite, Fluorite and Feldspar Deposits Are of Economic Importance to Dominion

SPAR is a word of uncertain etymology—though it is ascribed to old Anglo-Saxon and German roots—used by miners to mean any of numerous kinds of non-metallic rocks or minerals that have cleavage, are light in color, and possess more or less luster.

The accompanying mineralogical and commercial descriptions of heavy spar (barite), fluorspar (fluorite), and feldspar were prepared by staff members of the Dept. of Development, Canadian Pacific Ry., from reports by that department and by the Canadian Dominion and Provincial Governments, including the Bureau of Statistics.

The scientific data are applicable to spars throughout the world.—Editor.

Heavy Spar

Barite (or barytes), a sulphate of barium, is a mineral known also as heavy spar or lead bloom. When pure, its value depends upon its color, its weight, and its inert chemical character. The distinguishing properties are: high specific gravity as compared with that of other non-metallic minerals, insolubility in acids, and a green coloration of the flame when strongly heated.

Barite deposits form from the weathering of limestones or other rocks containing barite veins. The deposits worked generally are found in sedimentary rocks as veins and lenses whose width in places may be from 10 ft. to 50 ft. It is a common gangue mineral in veins, but in this mode of occurrence is seldom of much importance. In Canada it is found either as a vein filling or as a gangue, usually with fluorite and calcite accompanying particularly sulphides of lead and zinc.

The only producing deposit in Canada is near Lake Ainslie, Cape Breton Island. Other properties in the same district have produced. The veins are as much as 14 ft. wide and are in a red felsitic rock. Barite occurs also at Cheticamp, in Colchester and Hants counties and in other parts of the province, and some of these deposits have given production.

Occurrences are known in Bonaventure county, Gaspe district, and in the Saguenay valley of Quebec. In the townships of Buckingham, Templeton and Hull several veins have been found and some development work has been done.

In eastern Ontario, from Hastings and Renfrew to Carleton and Leeds, occurrences are known in the townships of North Burgess, Pakenham, Lavant, Ramsay, and at Dog Lake. The principal railway points are Smith's Falls, Carleton Place, Perth, Bathurst, Sharbot Lake and Lavant. In northern Ontario near Elk Lake, and in the Fort Matchewan district, are deposits of promise, as yet undeveloped. At Tionaga, in Penhorwood township, 140 miles west of Sudbury, a barite deposit has been proved by diamond drilling to the extent of several thousand tons. Some veins are known in the vicinity of Fort William, on McKellar and Pic Islands, from which shipments were made in the early '80s, but on which no work has been done since.

Barite is found in British Columbia as a gangue accompanying galena in deposits at Adams Lake, near Kamloops; and accompanying fluorite, at the Rock Candy mine, near Grand Forks. Near Spillimacheen, south of Golden, is an occurrence of barite in a vein containing sulphides. On Vancouver Island, north of Cowichan Lake, a vein containing barite has been discovered.

Exploration has indicated the presence of barite, at Pipestone Island, Manitoba, but there has been no development work to date.

Preparation and Uses

The following analyses are of typical Canadian barite in percentages.

	Lake Ainslie, N.S.	Tionaga, Ont.	Perth, Ont.	Buckingham, Que.
Silica	0.34	2.30	....	....
Iron and aluminum oxides	0.47	....	....	....
Calcium carbonate	10.71	trace	....	3.57
Calcium fluoride	1.28	....	....	....
Calcium sulphate	....	....	1.40	....
Barium sulphate	87.14	97.50	93.42	93.51
Strontium sulphate	....	....	4.10	1.00

The chief use of barite is in the paint and rubber industries. It is used in the manufacture of oilcloth, linoleum, shade cloth, pottery glazes, as a medium for colors on wall papers, in the leather industry, in the manufacture of chemicals as barium peroxide and barium chloride, in the making of optical glass, and in sugar refining.

In the paint industry it is used as a filler, as it is not attacked by weathering conditions, and gives a good surface for bonding and holding subsequent coats. There are three forms in which the material may be prepared: as ground barite, as lithopone, or as the precipitated sulphate, *blanc fixé*. The ground product must be pure white and finely ground. Lithopone is a mixture of barium sulphate and zinc sulphide prepared by precipitation. *Blanc fixé* is prepared by crushing the crude ore to a small size and heating in a rotary kiln after mixing with coal to such a temperature that the sulphate is reduced to the sulphide. The barium sulphide is then leached out with water and the precipitation made with sulphuric acid or with aluminum sulphate. The product is then washed, dried and ground. The barium sulphide solution may be used also in the making

of other compounds. Ground barite or *blanc fixé* may be used as a ground for aniline colors as they take a fine even staining. When used as a substitute for part of the whiting in putty, a saving in oil is effected.

Material for use in the rubber industry may be off-color but must be finely ground. A certain amount of barite gives rubber more resilience and a longer life.

In western Canada supplies of zinc, sodium sulphate, limestone and fuel in reasonable proximity to deposits of barite offer an opportunity for the establishment of an industry to manufacture chemical products.

There are two grades on the market—the crude and the ground. The crude is of two types: the hard crystalline type with vitreous lustre, and the soft, opaque, earthy type. The latter is preferred by mills as it is easier to grind. Most of the Canadian ores are of the former type. Those of the Lake Ainslie district, however, are of the soft opaque variety, with a platy structure. The best barite when ground is a clear white. It may be off-color owing to a small amount of sulphides or to iron oxide. It may be treated with sulphuric acid to dissolve out the impurities and then thoroughly washed, dried and ground.

The commercial product is graded according to the impurities, especially according to the iron and silica content.

The provinces of Nova Scotia, Quebec and Ontario do not demand royalties but tax profits on mines in excess of $10,000, as does the Dominion Government in Saskatchewan, Alberta, and the Yukon. The province of British Columbia imposes a tax of 2 per cent on any production of $5,000 or more. At the discretion of the Provincial Governments royalties may be imposed in New Brunswick and Manitoba. No bounties are granted.

Production and Markets

The production of barite in Canada in 1929 was 105 tons valued at $2,341. In 1928 production was 127 tons valued at $2,847. The imports were 2,646 tons valued at $52,078 in 1929, and 2,878 tons valued at $58,710 in 1928. No exports were reported in 1928 and 1929.

There is opportunity of establishing an industry using Canadian barite to supply the Canadian demand, but it would be difficult to manufacture for export against the high tariff to the United States ($7.50 per ton), and against cheap production in the European market.

Fluorspar

Fluorspar, or fluorite (CaF_2) is a mineral of varied appearance. In some phases, it is colorless, but generally it is tinted, especially in pale to deep shades of green or violet or less commonly of other colors, as yellow. It crystallizes in cubes, and cleaves easily in four directions, so that the corners of a cube can be split off. These crystals are generally more or less transparent, with a vitreous or glassy luster. Fluorspar also occurs in granular to compact masses, which may have a dull luster and no apparent cleavage. The mineral is fairly soft, being readily scratched by a knife blade. It melts at a comparatively low temperature, and some varieties are strongly phosphorescent when warmed.

Fluorspar usually occurs in veins which traverse limestone, slate or gneiss. Very frequently it is found as a principal gangue mineral in veins of galena and sometimes of blende. Other common associated minerals are barite, calcite and quartz. Tin ores also are usually accompanied by fluorspar.

Canada's production of fluorspar has come from two widely separated localities—one in Ontario, the other in British Columbia. The Ontario mines are located almost directly north of Belleville in the Madoc district, Hastings county. The fluorspar, associated with barite, calcite and sometimes a little celestite, occurs in veins which occupy fault fissures traversing the pre-Cambrian and overlying Ordovician rocks of the region.

The Rock Candy mine near Archibald is the source of the British Columbia fluorspar production. The mineral occurs here in quartz veins at a contact between bodies of alkali syenite and porphyry. In places the fluorspar-bearing zone has a width of 140 ft. and it has been mined on three levels for a vertical depth of about 200 ft. The product of this mine has been used chiefly as a flux in the smelting operations of the Consolidated Mining & Smelting Co. at Trail, B. C. In 1929 the output was 17,800 tons.

Fluorspar has been found in dozens of localities scattered throughout the Dominion from coast to coast but, with the exception of those already referred to and possibly one or two others, the known occurrences appear to be of mineralogical interest only.

A possible source that may merit investigation is the recovery of fluorite as a by-product from the concentration of such ores as barite of the Lake Ainslie district, N. S., Penhorwood Township, Ont.

Industrial Uses

It is estimated that from 80 to 85 per cent of the world's supply of fluorspar is consumed in metallurgical operations. In these the chief use of the mineral is as a flux, especially in the basic open-hearth process of steel manufacture; in blast furnaces producing iron, ferro-silicon and ferro-manganese; in iron foundries; and in gold, silver, copper and lead smelters. Another important metallurgical use of fluorspar or of compounds, such as hydro-fluosilicic acid, made from it, is in the preparation of electrolytes employed in the production of aluminum from its oxide and in the refining of lead and antimony.

From 10 to 15 per cent of the production is used in the manufacture of enamels, glazes, fire-proof (agate) ware, and opalescent glass. The chemical industry absorbs most of the remainder for making hydrofluoric acid and other compounds containing fluorine. Minor uses are: in making special (apochromatic) lenses, for which purpose the mineral must be colorless and transparent and free from

flaws and inclusions; as a cement in the manufacture of emery wheels and carbon electrodes; and for ornaments.

Markets and Production

As mined, fluorspar usually is associated with certain other minerals, as barite, quartz, calcite, and commonly galena and zinc blende, and these must be more or less completely removed before the material is marketed. The milling of the ore comprises such operations as hand sorting, crushing, screening, and jigging. Flotation methods are employed in some mills to eliminate such admixed minerals as zinc blende. Canadian fluorspar consists of both lump and ground spar. In some mines the fluorspar is in massive crystalline form and can be cobbed of impurities. In others it occurs as a loose sand or gravel.

The degree of purity demanded by buyers of fluorspar depends upon the purpose for which the material is to be used. The usual products are lump, gravel, and sand or ground, in three or four grades.

The provinces of Nova Scotia, Quebec and Ontario do not demand royalties but tax profits of mines in excess of $10,000, as does the Dominion Government in Saskatchewan, Alberta and the Yukon. The province of British Columbia imposes a tax of 2 per cent on any production of $5,000 or more. At the discretion of the Provincial Governments, royalties may be imposed in New Brunswick and Manitoba. No bounties are granted on the production of this mineral.

There was no production in 1928. In 1929 the production was 17,870 tons valued at $46,648. In 1929, 12,092 tons valued at $159,798 were imported, and 14,362 tons valued at $153,046 in 1928. No exports were reported. Fluorspar enters Canada free. There is no tariff in dealing with British possessions. Recent changes in the United States tariff affect Canadian imports as follows: Fluorspar containing more than 97 per cent CaF_2, $8.40 per ton; containing not more than 97 per cent, $5.60 per ton.

Feldspar

Feldspar is a common mineral that is well known in rocks of the granite class. In composition, it consists of silica and alumina with potash, soda, or lime. The potash variety, orthoclase, is the principal feldspar of commerce. The soda type is much less used, and lime feldspar has no specific use.

In appearance, feldspar is a gray or flesh-colored mineral. It gives a distinguishing color to most granite rocks and is recognized by its cleavage or way of breaking. In order to be of commercial use it must be found in relatively large masses and free from quartz or other injurious materials, especially iron or dark minerals such as mica or hornblende. It is quarried mainly in coarse-grained phases of granite, called pegmatite.

Sources

In the Laurentian plateau, which occupies a great part of northern Canada and which is largely a granite country, there are immeasurable quantities of feldspar. Much of this vast area, however, is inaccessible for mining at the present prices of feldspar. Practicable sources, therefore, are limited to the vicinity of railways or waterways. In localities favorably situated the concentration of feldspar within the pegmatite is the next important feature. In same districts, the pegmatite is fine in texture and the feldspar is in pieces only a few pounds in weight; in others, feldspar is in masses weighing many tons. Soda feldspar or dark minerals accompany the potash feldspar in some localities, while they are practically absent in others. All these restrictions go far to reduce the number of possible sources of good feldspar, which, after all, are somewhat rare.

Amongst many localities in Canada that have given production, the Buckingham district, between Montreal and Ottawa, Que., is outstanding for quantity and quality of output. It is still in active operation. There is production also from McArthur Siding in the Gatineau valley. A large deposit has been opened near Manikuagan bay on the north shore of the lower St. Lawrence.

Another outstanding locality is the Verona-Bathurst area in Ontario. There is production also from Britt and Burwash. About 50 miles west of Kenora, on Falcon island, feldspar, comparing favorably with the best commercial spars, occurs.

Promising deposits of feldspathic rock occur near Hope, 90 miles east of Vancouver in British Columbia.

Varieties and Uses

The price of the material and the nature of the deposits has so far permitted only open quarrying in Canada. Its principal use is for the manufacture of pottery, glazed tile, enamelware, porcelain insulators, domestic and sanitary porcelain. It is used also in making opalescent glass and for dental purposes. Lower grades are used in stucco work, building boards, roofing paper, abrasive soaps and poultry grit.

No. 1 spar is free from injurious minerals, should carry at least 12 per cent potash, and is not expected to contain more than 10 per cent quartz, a small percentage of which is not deleterious so long as the amount is constant and not sufficient appreciably to affect the fusion point. White mica does not affect color, but biotite is practically impossible to remove, spoils the color with gray flecks and adds to the iron content, which must not exceed one-half of one per cent. Garnet, tourmaline and hornblendes are injurious for the same reasons, but beryl is objectionable only on account of its effect on the fusion point.

No. 2 spar is allowed a little latitude from the above requirements, according to the use for which it is destined. For poultry grit and for stucco purposes the impurities are not objectionable, and their coloring matter may add to their value in the latter use.

Standardization of grades of Canadian feldspar, if effected, should prove of material benefit to both buyers and shippers. In the United States there has been a movement towards better control of the

(Continued on page 52)

Cableway bucket discharging load over bar grizzly.

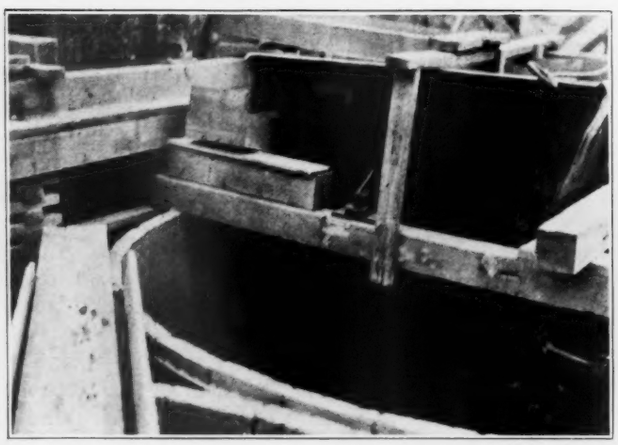
Operator Utilizes Excess Pea Gravel in Manufacture of Concrete Blocks

Regular Plant Crew Kept Busy Producing Units on Days They Were Formerly Idle

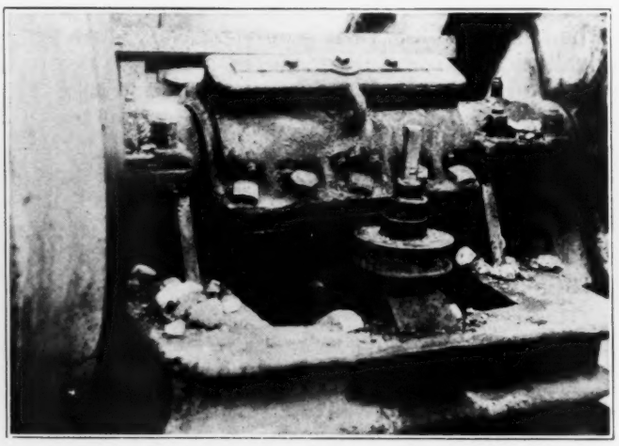
ONE of the major problems confronting practically every aggregate producer is the profitable disposal of waste sand and bird's-eye or pea gravel. In many plants the problem of disposal is serious enough without attempting to realize a profit on the waste. In the last year a number of state highway specifications for aggregates have been revised permitting coarser sands to be used. To some extent, this has been a great help to many of the Midwestern plants. Pea gravel, however, has not found a place in road-construction specifications. While it is true that many highway department laboratories and engineers have been experimenting with this size gravel in an effort to eliminate some of its waste, it is improbable that there will ever be a market that will absorb the full production.

One of the means often suggested to make use of this material is in the making of concrete blocks. These blocks are well known to the building trade. They are widely used in the foundations of residences and garages and for exterior trim. Practically every large city has one or more plants producing such blocks.

That the making of concrete blocks is profitable has been demonstrated in a small Indiana plant



Sand-settling tank above the concrete-stave bin.



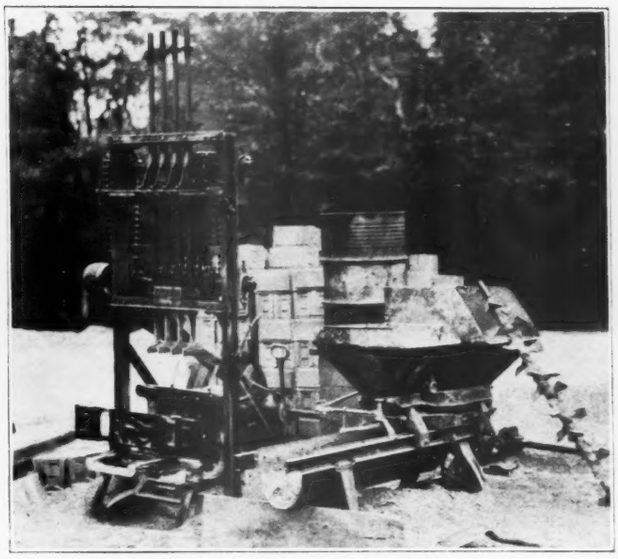
The 8-in. by 24-in. jaw crusher.

where one block machine has been tried out this year. The Shera Sand & Gravel Co., operating a 300-ton plant within two miles of Richmond, was confronted with occasional periods of inactivity lasting a day or two, as well as a growing stock-pile of excess pea gravel. A survey of the Richmond market for concrete blocks indicated a fair possibility of disposing of as many concrete blocks as could be produced by the regular plant crew during the periods of idleness. Accordingly, a Miles block machine capable of producing 35 blocks per hour and a Kent worm-type continuous concrete mixer were installed in the open yard near the tipple. Both machines are driven from a line-shaft which is powered by a General Electric 7½-hp. motor.

The standard-size block, 16 in. long, 8 in. wide and 8 in. deep, is made, using sand and pea gravel aggregates with two grades of cement—depending on order requirements. The Lehigh quick-set grade permits the blocks to be used in three days. Miami high-early-strength cement is normally used and the blocks are stocked at least a week for curing. Throughout the summer a steady sale of blocks kept the pea-gravel stock-pile down to practically nothing. In fact, the company plans to build a large stock of the gravel for winter operation, employing the regular crew throughout the year.

Now that the venture has proved successful, a permanent building with walls of these blocks will house the equipment permanently. With the present equipment, 350 blocks can be produced per day by two men.

Obviously, one of the worth-while advantages is the fact that at least some of the men will have year-around employment, reducing the number of "floaters" needed with the seasonal demand for sand and gravel. Loss of time owing to temporary lay-offs caused by shipping fluctuations is also averted.



The block machine and continuous mixer.

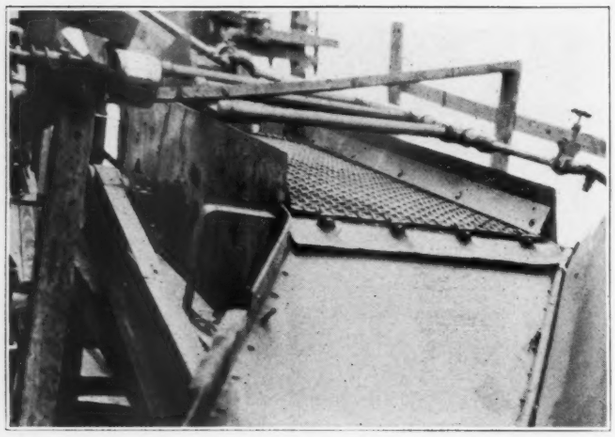
The Shera plant is operated in a pit having a 60-ft. bank of sand and gravel averaging about 50 per cent sand. The site contains twenty acres of available land. Overburden consisting of two feet of soil is removed by contractors.

A Sauerman cableway with a ½-cu. yd. bucket, operated by a Thomas double-drum hoist powered by a General Electric 50-hp. motor, removes the raw material from the pit, dumping it over a 10-ft. by 14-ft. grizzly hopper above the plant. The rails of the grizzly are set 5½ in. apart to reject boulders and niggerheads. A hopper beneath the grizzly feeds the material to a Simplicity 3-deck, 2½-ft. by 5-ft. vibrating screen which is equipped with pipe-jet washing nozzles supplied with water from a nearby spring-fed creek. The three decks are equipped with the following mesh screens: top, 1½-in.; middle, ½-in.; bottom, ⅛-in. Rejects from the top deck are sent to a Universal 8-in. by 24-in. jaw crusher, set at 2 in. and powered by a 20-hp. motor. Crushed gravel is returned to the scalping-screen deck by a 21-ft. elevator equipped with 12-in. by 5-in. cast-iron buckets.

Classified material from the vibrating screen is chuted to six loading bins, two of which are Neff &

Concrete loading tunnel beneath silos and bins.

Pump-house at the dammed-up creek.



Top panel (used for scalping) of 3-deck vibrating screen.

Fry 30-cu. yd. concrete-stave bins. One Neff & Fry bin has a Telsmith No. 5 settling tank mounted above and discharging masons' sand into it. The other concrete-stave bin carries ½-in. to 1-in. gravel. The other four bins contain 30 cu. yd. of road gravel, 40 cu. yd. of ½-in. to 1½-in. gravel, 20 cu. yd. of ⅛-in. sand, and 20 cu. yd. of pea gravel. Two Telsmith No. 5 settling tanks are used for sand classification.

A spring-fed creek, retained by a small concrete dam, furnishes the wash-water. A 4-in. by 3-in. single-suction centrifugal pump, driven by a Lincoln 20-hp. motor, supplies the water to the plant. By providing a dammed depression, the waste wash-water will be permitted to clarify and the clear water to flow to the creek. This method will provide a dependable supply of water in the event of another continued dry season.

Soapstone and Talc in Vermont

(*Continued from page 36*)

clean of accumulated dust at frequent intervals.

The five silos that hold fine talc have a storage capacity of 250 tons each, while either of the silos assigned to roofing stock can accommodate 300 tons of that material. The silos are 20 ft. in diameter and 30 ft. in height. They discharge into baggers. Two of these are Bates packers which deliver the talc automatically into valve bags of paper. These machines can each pack more than two carloads of talc in the course of a day. Each bag contains 50 pounds of the fine material. The Johnson mill is of a thoroughly modern type and contains equipment of the latest design for work of the kind in hand there.

While talc has many uses, as mentioned earlier in this article, its largest single use is as a filler or loading material in the production of paper. The greatest consumers of talc are plants engaged in the manufacture of newsprint, but the stuff is employed helpfully in turning out paper ranging all the way from the cheapest to the finest grades. When so employed, talc takes the place of the best white clay, talc being superior to clay for this purpose because it is retained better than clay by the paper stock. Paper and pasteboard containing talc acquire a very high surface. It is this finish that determines how well a paper will take ink and contribute to first-class printing.

Demand for Sand From New Plant

(*Continued from page 42*)

arated into two grades. A Link-Belt flight conveyor delivers the sand, by a chute, to two screw-type sand-boxes which were made by the Lewistown Foundry & Machine Co., Lewistown, Pa. The bottom of the chute contains ¼-in. perforations where it passes the first sand-box so that this grade drops to this box. The oversize—¼-in. to ⅜-in.—passes to the second box. The screws in these boxes are driven by a Crocker-Wheeler 10-hp. motor. Water for the washing is furnished through a 4-in. pipe-line which extends about 1,400 ft. to a small pump station at the river. A Harris Pump & Supply Co. 6-in. by 5-in., 2-stage centrifugal pump, driven by a Fairbanks-Morse 50-hp. ball-bearing motor, lifts the water through the pipe-line.

Shipments of Canadian Feldspar at Low Ebb Last Year

Shipments of feldspar by Canadian producers during 1929 increased 17.6 per cent in quantity and 19.5 per cent in value over the totals for 1928, according to finally revised statistics just issued by the mining, metallurgical and chemical branch of the Dominion Bureau of Statistics at Ottawa. The production in 1929 amounted to 37,527 tons valued at $340,471 as against 31,897 tons worth $284,942 produced in 1928.

Crude feldspar exported from Canada during 1929 totalled 29,896 tons valued at $242,915; these exports were principally to the United States. An increase of 24.7 per cent was recorded in the imports of feldspar into Canada in 1929. Importations during the year amounted to 3,955 tons appraised at $65,997 as against 3,171 tons at $53,818 in 1928.

The 19 firms in operation during the year reported a total capital investment of $223,443. Salaried employees and wage-earners engaged in this industry totalled 209 and their combined earnings were $164,440. Fuel costs for the year amounted to $14,122.

Granite Production Reported Higher in North Carolina in 1929

In an incomplete report on the output of minerals in North Carolina for 1929 by State Geologist H. J. Bryson and the U. S. Bureau of Mines, granite is featured with an increase of more than 20 per cent over the previous year, the value of production being $4,454,468 as compared with $3,663,539 the previous year.

Marble and limestone, however, fared differently from granite with a falling off of activity. The output during 1929 was valued at only $260,574 as against $342,786 the previous year.

Increased Recovery of Phosphate in the Florida Land-Pebble District*

By H. M. LAWRENCE
Metallurgist, U. S. Bureau of Mines, Tuscaloosa, Fla.

THE land-pebble district, the larger of the two phosphate-producing areas of Florida, is situated in Polk County and in the eastern part of Hillsborough County. About 80 per cent of the phosphate rock produced in the United States in recent years has been mined from this area. The phosphate ores, locally termed *matrix*, are beds of sands and clays containing the phosphate pebbles, considered to be Pliocene in age, derived by marine action from underlying Miocene phosphatic marls, and are covered by practically barren sands and clays that have been deposited more recently. Open-pit mining is practiced; hydraulic mining, which has been intensively developed in this district, is used exclusively for mining the matrix and by some companies for removing the overburden, although drag-line excavators have become established and are proving economical for stripping operations. From the pits the matrix is pumped to adjacent washing plants for beneficiation. The product of the washers, after drying, enters the world markets as Florida pebble phosphate.

In this district the recovery of the phosphate pebbles by the washing plants has not been particularly effective in the past. The screening, designed to effect a separation at about 20 mesh (0.033 in.), has not been well controlled. Washer rejects discarded to the waste dumps have contained appreciable amounts of material analyzing above the minimum commercial grade—66 per cent bone phosphate of lime. Such losses of commercial fractions should be considered avoidable.

During the past few years, research has been actively conducted with other metallurgical processes that may be applied to supplement the washing operations and utilize more completely the phosphate content of the matrix. From this research campaign, one process — flotation — has emerged and others are being developed. Of perhaps equal importance, however, has been the notable progress made in decreasing the losses of commercial fractions, or sizes with an analysis above 66 per cent bone, in the material discarded to waste by the washers. These losses—large in 1927 and in the early part of 1928—have been steadily decreased and, as far as a screening operation is concerned, have now been reduced to the economic limit in several washing plants. This article discusses certain features connected with the improvements effected in the washing practice of this district.

So far as the equipment is concerned, the washing practice, as now carried on, does not vary greatly from the methods used some years back. A simple washing and screening operation is used. For disintegrating the matrix, the use of log washers, supplemented in some plants by revolving drums equipped with flights to break up lumps of clay, is favored. Vibrating screens or trommels, occasionally supplemented by stationary inclined screens, remove fine sand. In some plants bowl-classifiers, cones, and settling boxes have been installed recently; this added equipment is operated either as an integral part of the washer or as an anxiliary unit. When technical control has been maintained, this auxiliary apparatus has effected improvements in the results obtained by the washers.

Although the equipment of the washing plants has not changed markedly, the flow sheets have been altered and re-treatment has become standard practice. True, re-treatment has had its place in the flow sheets of many plants for several years, but it has been limited to certain pulps. However, in the winter of 1927-1928 two companies decided, as a result of some data on their washer rejects, to extend re-treatment to other pulps discarded from their washers. In the changed flow sheets practically all log-washer overflows and screen-undersize products received a second settling and screening treatment. This practice, adopted at first without full interchange of information between the companies, has spread throughout the field. Decreased losses of commercial fractions resulted from the first steps toward complete re-treatment. Naturally, favorable early developments accelerated the efforts of the operators. When due allowance is made for their particular operating conditions it now seems that several washers are obtaining the economic maximum recovery possible with a screening operation.

To obtain this increase in plant efficiency more reliable data on the washer rejects discarded to waste have been essential. Under former practice sampling in the washers was confined to the finished product of phosphate rock. Early attempts to obtain increased recoveries were guided only by samples from test pits in the debris-bank sands. Such samples were unsatisfactory, however, as the proportions of the total washer rejects that the debris-bank sands represented was not known. To sample the total washer rejects, mechanical sampling devices have been developed by several companies during the past year. The application of mechanical sampling has not been simple, for washers in the land-pebble district frequently discharge fine sands and slimes to waste at the rate of 200 cu. yd. of solids per hour in a pulp with from 4,000 to

*Reprinted from U. S. Bureau of Mines Report of Investigations 3023.

10,000 gal. of water per min. Even with mechanical samplers the data on washer operations are not always concordant, but more reliable deductions are possible.

Typical Phosphate Ores

In the land-pebble district of Florida the phosphate-bearing deposits vary markedly in physical characteristics. The beds themselves range in minable thickness from 6 to 25 feet and vary from gravel banks to clays that are nearly as hard as shales; all gradations from gravel to hard clay are found. In some deposits the majority of the phosphate grains are coarser than the sand grains. In other deposits over half the phosphate is contained in the finer sizes; in these sizes the grains of phosphate are accompanied by grains of sand of the same size from which separation by a washing and screening process is impossible. Chemical analysis alone is not sufficient to determine the value of a phosphate deposit. Physical and chemical analyses, together with engineering data on the extent and thickness of the deposit, are required before an intelligent decision can be made regarding the commercial possibilities of any deposit.

Differences in the phosphate grains are also marked. Some of the phosphate grains are hard, well rounded and polished, and dark black in color. There are all gradations between pebbles of this type and the soft, light-colored, amorphous variety. In composition the phosphate minerals are complex and contain varying amounts of lime, flourine, magnesia, iron, alumina, organic matter, and minor impurities in addition to the lime phosphate. Phosphate pebbles, particularly the softer lighter-colored grains, frequently have small grains of sand attached to or included in the pebbles; such sand grains can only be separated after grinding fine enough to liberate the individual sand grains. The phosphate content of the different types of grains is also widely varied. Color is not necessarily an indication of the grade of individual grains, for light-colored grains that seem to be similar in appearance under moderate magnification frequently show differences in chemical analysis of from 2 to 10 per cent bone phosphate of lime. From some of the phosphate ores it has not been found possible to separate clean mineral that will analyze higher than 73 to 74 per cent bone phosphate of lime. When viewed under a microscope these phosphate grains show no attached particles of sand. From other ores clean picked grains may contain as much as 80 per cent bone phosphate of lime.

A clearer picture of the marked differences in the characteristics of the phosphate deposits in the Florida land-pebble area may be obtained by an examination of the data in Table I. The screen analyses there given for matrix A and matrix B are entirely typical of extensive deposits now being exploited by two large companies. For matrix C the data given are representative of another type of deposit that is also being mined. Matrix C was selected to emphasize the differences in the character of the deposits. It will be noted that in these three ores the sizes coarser than 20-mesh are commercial in analysis (66 per cent bone phosphate of lime or higher) and that the sizes finer than 20-mesh are non-commercial. An efficiently operated washing plant should recover nearly all of the commercial fractions. However, the amount of phosphate rock produced from any given tonnage and the percentage of the total phosphate content of the matrix recovered by the washers would vary markedly on these three ores. For these three ores the indicated maximum yield—tons of phosphate rock per 100 tons of matrix—would be 25.2, 37.1, and 42.9 for A, B, and C, respectively. The percentages of the phosphate

TABLE I—SCREEN ANALYSES OF THREE TYPICAL PHOSPHATE ORES

MATRIX A

Mesh size (*In.*)	Weight, (*per cent*)	Analysis, (*per cent*)		Distribution	
		B.P.L.	Insol.	B.P.L.	Insol.
− 1.0					
+ 3	1.6	74.2	6.0	2.6	0.3
+ 4	2.3	74.8	5.8	3.7	0.4
+ 6	3.9	74.6	5.7	6.3	0.7
+ 8	4.2	75.6	5.0	6.8	0.6
+ 10	3.7	75.8	4.7	6.0	0.5
+ 14	5.8	76.1	4.5	9.5	0.8
+ 20	3.7	75.9	5.0	6.0	0.6
+ 28	4.8	62.2	16.6	6.4	2.4
+ 35	6.5	53.5	26.2	7.5	5.0
+ 48	10.4	38.5	46.1	8.6	14.2
+ 65	22.5	34.2	53.3	16.6	35.6
+100	3.3	38.9	43.7	2.8	4.3
−100 (sand)	2.4	27.2	59.5	1.4	4.2
−100 (slime)	24.9	29.5	41.3	15.8	30.4
Totals and averages...	100.0	46.5	33.7	100.0	100.0

MATRIX B

− 1.0+3	7.4	66.4	9.2	12.2	1.6
+ 4	4.4	67.5	8.1	7.4	0.9
+ 6	4.6	68.7	7.4	7.8	0.8
+ 8	5.2	68.3	6.9	8.8	0.9
+ 10	6.3	69.4	6.8	10.8	1.0
+ 14	5.8	69.7	6.5	10.1	0.9
+ 20	3.4	66.9	7.8	5.6	0.8
+ 28	2.6	51.6	29.8	3.3	1.9
+ 35	5.2	29.5	59.4	3.8	7.5
+ 48	10.9	19.5	73.4	5.2	19.3
+ 65	16.1	19.3	74.2	7.7	28.7
+100	2.6	19.8	73.3	1.3	4.6
−100 (sand)	1.7	19.6	73.7	0.8	3.0
−100 (slime)	23.8	25.7	49.1	15.2	28.1
Totals and averages...	100.0	40.4	41.5	100.0	100.0

MATRIX C

Mesh size (*In.*)	Weight, (*per (cent)*)	Analysis, (*per cent*)		Distribution	
		B.P.L.	Insol.	B.P.L.	Insol.
− 1.0+3	4.2	65.3	9.7	7.5	0.8
+ 4	3.7	67.9	6.2	6.9	0.5
+ 6	7.2	68.2	6.0	13.5	0.9
+ 8	7.1	68.6	5.8	13.3	0.9
+ 10	8.2	69.0	6.2	15.5	1.0
+ 14	9.6	69.3	6.3	18.2	1.2
+ 20	2.9	66.1	10.4	5.2	0.7
+ 28	2.6	53.2	32.1	3.8	1.7
+ 35	8.3	17.6	74.2	4.0	12.6
+ 48	13.5	7.8	89.0	2.9	24.6
+ 65	20.4	7.3	89.6	4.1	37.4
+100	4.5	5.3	92.1	0.7	8.5
−100 (sand)	2.0	7.4	85.6	0.4	3.5
−100 (slime)	5.8	25.2	48.2	4.0	5.7
Totals and averages...	100.0	36.5	48.9	100.0	100.0

SUMMARY

	Matrix A			Matrix B			Matrix C		
	Weight, (*per cent*)	Analyses, (*per cent B. P. L.*)	Distribution (*B. P. L.*)	Weight, (*per cent*)	Analyses, (*per cent B. P. L.*)	Distribution (*B. P. L.*)	Weight, (*per cent*)	Analyses, (*per cent B. P. L.*)	Distribution (*B. P. L.*)
Commercial (+20 mesh)	25.2	75.5	40.9	37.1	68.3	62.7	42.9	68.2	80.1
Noncommercial (−20 mesh)	74.8	36.7	59.1	62.9	23.9	37.3	57.1	12.7	19.9
Total matrix.....	100.0	46.5	100.0	100.0	40.4	100.0	100.0	36.5	100.0

Matrix A—Heavy clay matrix containing high-grade phosphate pebbles.
Matrix B—Heavy clay matrix containing low-grade phosphate pebbles.
Matrix C—Sand or gravel matrix containing low-grade phosphate pebbles.

content recovered in the washer product of phosphate rock would be 40.9, 62.7, and 80.1 for A, B, and C. Yet, under these conditions, the washer operations of all three plants would be equally efficient.

Losses in Washer Rejects

In Table II, data obtained from recent studies of operations in the Florida land-pebble district are presented. These data have been obtained from representative samples of washer rejects during sampling campaigns ranging from a week to three months in length. Samples of washer rejects for washers 1 to 4 were taken mechanically; washer 5 was sampled by hand methods and the data are perhaps somewhat less reliable. It is realized that the data presented are not directly comparable, as the phosphate deposits have markedly different characteristics. Even though the results obtained by one washer can not be compared with the operations of another plant, the data given demonstrate strikingly the improved recoveries and increased efficiencies of the phosphate washing plants.

In considering the data in Table II emphasis must be placed upon the information in columns 2 and 3. For the majority of the deposits in the Florida land-pebble area, the material coarser than 20 mesh is commercial in grade and the finer sizes are non-commercial. The recovery of the commercial fractions—plus-20-mesh pebbles—is the objective of the washing and screening processes. Also, rigid requirements as to the grade of the phosphate rock produced prevent the inclusion of any appreciable amounts of the sands finer than 20 mesh in size. The weight percentage of commercial fractions in the washer rejects is one measure of the efficiency of the washer operation. The marked decreases in the plus-20-mesh material in the washer rejects without lowering the quality of the phosphate rock produced furnish evidence of recent advances in washing practice in the district.

From time to time attempts have been made to determine the percentage of the plus-20-mesh material that the washer recovers. Unavoidable irregularities in the sampling and sizing of the matrix, the phosphate rock produced, and the washer rejects render such calculations difficult and unsatisfactory. Wherever the data are reasonably concordant, the percentage of the desired material saved in the washer is in the range from 95 to 98.6 per cent of the commercial fractions in the matrix mined.

The percentage of the phosphate that the washer recovers (col. 5) from the matrix and the phosphate content of the washer rejects (col. 4) are interesting but, of themselves, give no direct indication of the washer efficiency; data on these factors simply bring out more clearly the markedly varying character of the phosphate deposits and the fact that more fine grains of phosphate are found in some deposits than in others.

In column 6 of Table II estimates of the increased recovery of phosphate by more complete screening are given. The savings average about 6 per cent or, for a 50-ton washer, 3 tons per hour. In several plants the increased savings are larger. Although the washing plants weigh the phosphate rock saved by the re-treatment or reclamation units, exact data on increased recoveries are not obtainable, as part of the rock recovered in these units was saved by their former practice. On the basis of an additional recovery of 3 tons per hour the average washer will show an increased production of from 10,000 to 15,000 tons of phosphate rock annually, depending upon the operating schedule; at least two and perhaps more washers show additional savings in excess of these figures.

TABLE 2—DATA ON WASHING PLANT OPERATIONS BEFORE AND AFTER CHARGES

Washer No.	Total Washer Rejects			Present Recovery	Increased Recovery by More Complete Reclamation, (*per cent*)
	Commercial Fractions, (*weight per cent*)		Analysis, (*per cent B. P. L.*)	Total Phosphate in Matrix Recovered by Washing Plant, (*per cent*)	
	Before Changes	After Changes	After Changes		
(1)	(2)	(3)	(4)	(5)	(6)
1	4 to 8	0.9	25.3	64	Data not available
2	7 to 12	2.1	11.6	85	4
3	3 to 7	1.2	20.5	52	6
4	3 to 7	1.0	18.1	50	7
5	3 to 7	1.3	25.5	44	7

NOTE: Washers 3 and 4 are new plants. Losses noted under former practice represent customary results obtained by the older plants of these companies.

Increased Recoveries

In connection with the programs of the mining companies to obtain more complete recoveries of phosphate rock by screening, it may be of interest to trace the development of one of the large washing plants of the district. This washer, designed to save all material coarser than 3/64-in. or 14-mesh size, went into operation in the early summer of 1927. In the flow sheet of the plant provision had been made for re-treatment of certain screen undersize products, but the importance of complete reclamation of all commercial fractions was not emphasized.

During the first year's operation of this plant the production schedule for which the washer had been designed was greatly exceeded. Washer operations were not well controlled, and large losses of commercial fractions resulted. The data given for August, 1928, in Table III are representative of the results obtained during the first period. Of the commercial fractions present in the debris-bank sands—14.9 per cent by weight—about one-half or 7 to 8 per cent of the weight of the sands was coarser than 14 mesh. The matrix treated by this washer is largely gravel and sand with only small amounts of clay, so that from 85 to over 90 per cent of the total washer rejects are usually deposited in the debris-banks. At this plant, sampling of the debris-bank sands gives a much better idea of the washer operations than do similar samples from plants treating a clay matrix where the debris-bank sands may represent not more than a half of the material discarded to waste by the washer.

In the next six-month period—August, 1928, to February, 1929—washer operations were better controlled. The capacity for which the plant was designed was more nearly approximated. Screens received more attention and were changed as soon as the openings began to enlarge. As a result of

these efforts, the losses of commercial fractions decreased steadily. In February, 1929, the percentage of commercial fractions—plus-20-mesh material—in the debris-bank sands was down to 8.6 per cent, of which about half was plus 3/64-in. or 14-mesh size. Sampling of the total washer rejects early in March, 1929, showed 6.8 per cent of the weight to be commercial in analysis. The sampling campaigns in February and March, 1929, yielded concordant data.

Although losses of commercial fractions had been decreased by better control of the washer operations, it was evident that, if larger recoveries of the commercial fractions in the matrix were to be obtained, re-treatment of all washer pulps was necessary. To accomplish more complete reclamation an auxiliary plant consisting of a bowl-classifier and a set of vibrating screens was designed in March and installed in July, 1929. After familiarity with the unit was obtained the losses of commercial fractions decreased markedly. In November, 1929, the total washer rejects contained only 3.4 per cent of the weight as plus-20-mesh material. Later a series of inclined stationary screens was installed to assist the vibrators. In March, 1930, only 2.1 per cent of the weight of the washer rejects was plus-20 mesh.

In view of the peculiar conditions of the deposit, it may be considered that this plant has reached the economic point for a washing and screening operation. On a test run with washer rejects containing 1.3 per cent plus-20-mesh material, the grade of the phosphate rock produced by this reclamation unit was lowered to less than 66 per cent bone phosphate of lime, the minimum commercial grade now regularly marketed in the district. To maintain the desired grade of products, the oversize of the screens in the reclamation unit must contain 90 per cent by weight plus-20 mesh. A screening separation designed to save all of the plus-20-mesh material in a product containing not over 10 per cent minus-20-mesh size is difficult under any conditions and is particularly difficult at this plant.

Summary

An investigation of the washing of phosphate ores in the land-pebble district of Florida has been in progress since July, 1927. In this investigation the characteristics of typical phosphate ores and of the material rejected to waste by the washing plants have been studied. From the data obtained in this investigation it appears that:

1. There are differences in the characteristics of the phosphate ores that markedly affect the recoveries that are possible with washing and screening operations.

2. As compared with former practice, increased recoveries are now being obtained by re-treatment of the washer rejects. These increased recoveries average 6 per cent and in certain plants amount to from 10,000 to 15,000 tons of phosphate rock annually.

TABLE 3—PROGRESSIVE DECREASE IN COMMERCIAL FRACTIONS IN WASHER REJECTS

Date	Sample	Washer Rejects Analyses, (*per cent B. P. L.*)	Commercial Fractions in Washer Rejects (*plus-20-mesh or 1/32-in. size*)	
			Weight, (*per cent*)	Total Phosphate in Rejects, (*per cent*)
(1)	(2)	(3)	(4)	(5)
Aug., 1928	Debris-bank sands	24.7	14.9	41.2
Nov., 1928	Debris-bank sands	22.2	12.3	37.8
Feb., 1929	Debris-bank sands	16.2	8.6	35.5
Mar., 1929	Total washer rejects	18.7	6.8	24.3
Oct., 1929	Total washer rejects	13.4	3.9	19.2
Nov., 1929	Total washer rejects	15.1	3.4	14.8
Mar., 1930	Total washer rejects	11.6	2.1	11.9

Spars in Canada

(*Continued from page 45*)

mill product. Another advance has been the formation of the Feldspar Grinders' Institute, Inc., which aims to foster close relationship and co-operation between trade units. These are steps in the right direction.

Analyses of typical No. 1 grade Canadian feldspar vary in the different districts within the following limits:

Silica	64.01	to 66.00	per cent
Alumina	18.00	to 19.00	per cent
Iron	0.05	to 0.50	per cent
Lime	0.30	to 1.00	per cent
Potash	11.50	to 14.00	per cent
Soda	1.50	to 3.50	per cent

The present demand for ground feldspar for ceramic and other uses is between 8,000 and 10,000 tons per year. A grinding mill is in operation at Kingston, Ont. Another is being built at Buckingham, Que., to meet the growing demand of the Canadian trade. At present most of the Canadian production is exported as crude, and much ground spar is imported.

Production and Markets

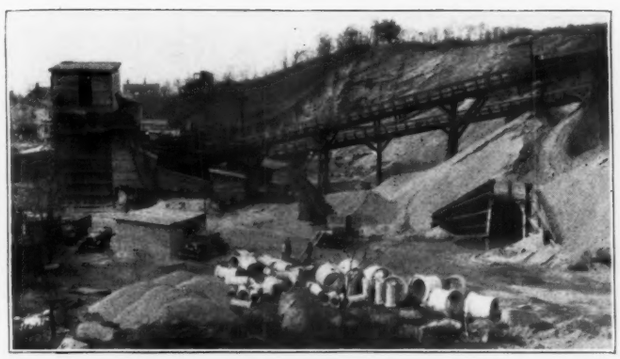
Norway and Sweden are the most important European producers. They export largely to Great Britain and the Continent. The demand from the great ceramic industries of Great Britain is met in part by the native Cornish stone which is a granite rock, taking its name from the area of its occurrence, formed of quartz and feldspar. The United States imports large quantities of Cornish stone for use with the American and Canadian feldspar, and a small tonnage is used in Canada.

The United States is the largest producer of feldspar in the world; nevertheless there is a growing demand for Canadian feldspar in that country's ceramic industries. Efforts to introduce the Canadian feldspar into Great Britain have not been successful but, probably in time, something may be accomplished in this direction.

The Provinces of Nova Scotia, Quebec and Ontario do not demand royalties but tax the profits of mines in excess of $10,000, as does the Dominion Government in Saskatchewan, Alberta and the Yukon. The Province of British Columbia imposes a tax of 2 per cent on any production of $5,000 or more. At the discretion of the Provincial Governments, royalties may be imposed in New Brunswick and Manitoba. No bounties are granted on the production of this mineral.

The average production in recent years has been about 33,000 tons per annum, practically the whole of which has been from the districts above enumerated, with a selling price of about $8 per ton, f. o. b. cars at the shipping point for the crude spar.

Intake-Line Trap Prevents Large Stone From Entering Dredge Pump



Plant from east; loading tunnel at right.

Plant from west showing stock-piling conveyors.

Excessive Quantity of Sand in Deposit Is Quickly Stock-Piled at New Plant

By W. E. TRAUFFER

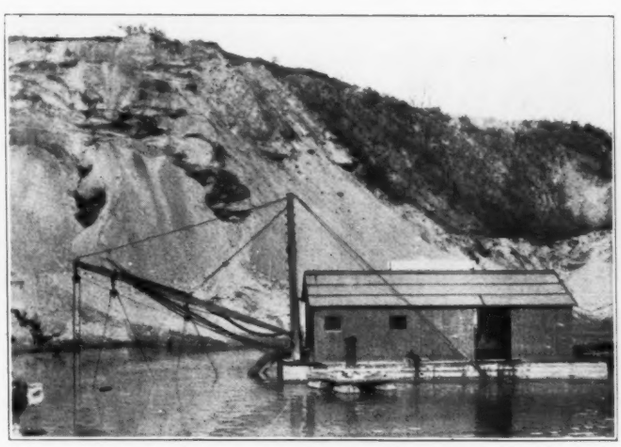
A DREDGE with a capacity of 75 tons per hour and several features of special interest has been put into operation by the Albany Gravel Co. at Croton-on-Hudson, N. Y. This company's initial sand-and-gravel plant is at Albany, N. Y.

Chief among the features of this new dredging operation is the quick and economical manner in which the excessive amount of sand in the deposit is stock-piled. The plant went into operation May 1, 1930.

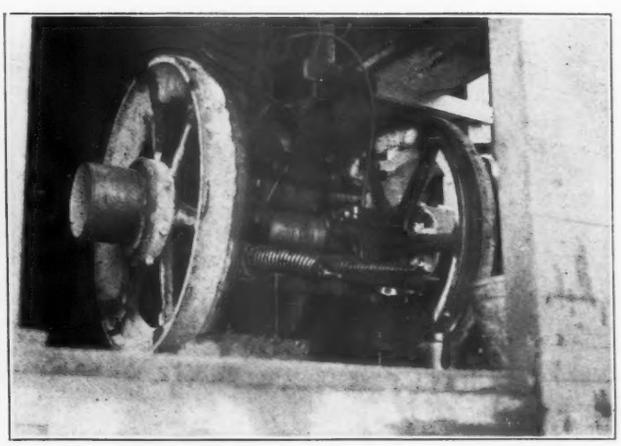
The deposit of 15 acres is located on the east bank of the Hudson River alongside State Highway No. 9 between Albany and New York City, and is inside the city limits of Croton-on-Hudson. The deposit averages about 85 per cent sand and 15 per cent gravel, about 25 per cent of the latter requiring crushing. The bank stands about 85 ft. in height above the pond level and dredging is done to a depth of about 25 ft. below this level. It is estimated that the deposit contains more than 1,500,000 cu. yd. of commercial material, all of which can be recovered with the present equipment. The dredge-pond is artificial and, although it is several hundred yards from the Hudson River, it is subject to a tidal variation which, at this point, is about 6 in.

The dredge was designed by the Morris Machine Works which also furnished most of the equipment. It has a wooden hull and superstructure and is held in place by shore lines. The Morris 8-in. centrifugal dredge-pump is the latest type with renewable manganese-steel lining and water-lubricated rubber bearings. It is direct-driven by a 125-hp. motor through a Falk spring coupling and a Transmission ball bearing. The 40-ft. intake is supported by cable from a timber boom and is handled by a one-drum Domestic hoist. The swing of the boom is controlled by block and tackle.

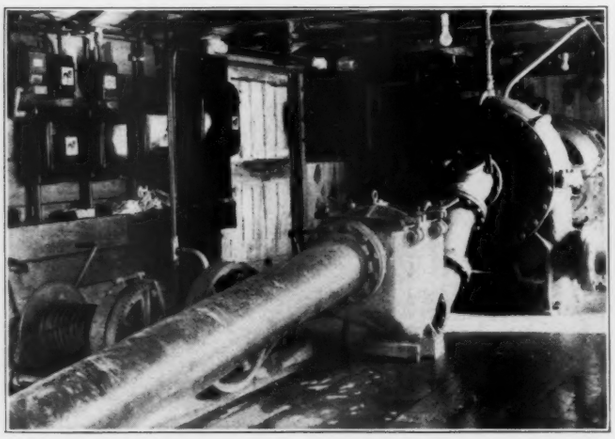
The 10-in. intake feeds to a Morris stone-trap with bars spaced 4½ in. apart to keep large stones from reaching the pump. This trap needs to be opened and cleaned out about twice a day on an average, the operation requiring only a few minutes of one man's time. The 8-in. discharge line to the plant is now only about 200 ft. long and does not



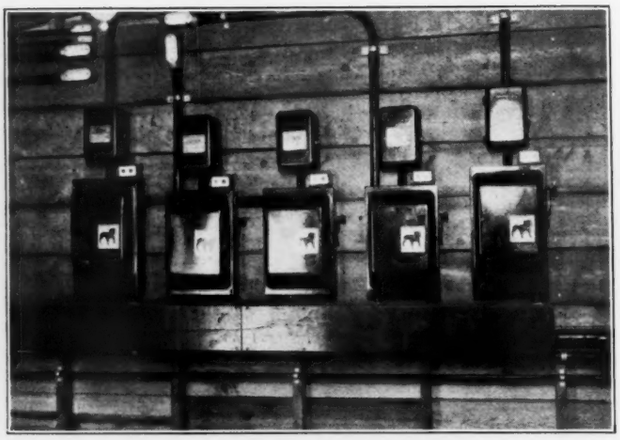
Close-up view of the dredge and bank.



The 10-in. by 20-in. jaw crusher.



The 8-in. dredge pump and stone trap. Hoist at left.



Electrical-control building showing neat layout of switches.

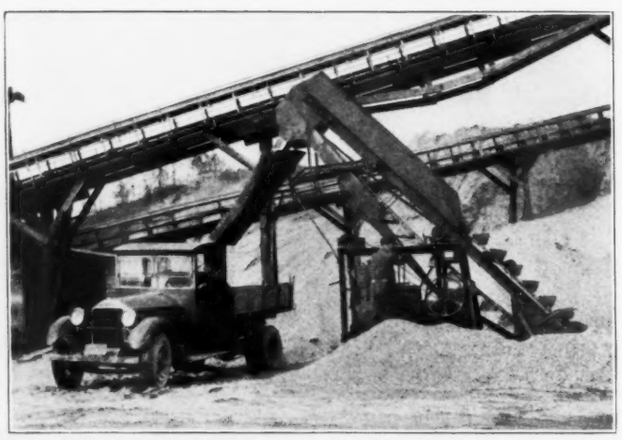
require pontoons. A Morris 4-in. centrifugal pump primes the dredge-pump and furnishes water for two jets. One of these is on the intake nozzle for loosening up the deposit while the other is on the boom and is used to cave the bank into the pit. Another pump of the same size and make furnishes wash-water for the plant.

Each of the two water pumps is direct-driven by a 20-hp. motor, and the hoist is driven by a 5-hp. motor through a Texrope drive. Manhattan Dreadnaught suction hose, Goodyear dredging sleeves, Jenkins valves and Dixon hose-clamps are used.

The plant was designed by the Good Roads Machinery Co. Foundations are of concrete and the framework and buildings are of timber. The pipeline from the dredge discharges onto an inclined plate screen with 2½-in. perforations to break the force of the flow. Below this is an inclined woven-wire screen with ¼-in. mesh. The material passing through this screen goes through a split chute to two Good Roads 5-ft. by 20-ft. sand-drag boxes which produce concrete sand. The overflow from these goes through a flume to a third Good Roads sand-drag-box. This has the same size and number of paddles but has a 10-ft. by 20-ft. box. This produces plaster sand, and the over-flow goes through a flume into a worked-out section of the pit.

Plaster-sand box and belt conveyors to stock-piles.

The concrete sand is fed from the first two boxes to a 24-in. inclined belt conveyor, on 130-ft. centers, which discharges onto a stock-pile. The plaster sand is fed from the third box to a 24-in. conveyor and then onto a 24-in. belt conveyor on 150-ft. centers. This discharges onto a stock-pile alongside the first but far enough away to keep the two sizes of sand from mingling. Trucks are loaded directly from storage through clamshell gates in a tunnel under the piles. Approximately 5,000 cu. yd. can be recovered from each stock-pile without rehandling. It can be seen that only a few minutes elapse from the time the material enters the dredge intake until the sized sand is in the stock-piles. This



Gasoline-operated loader and truck at stock-piles.

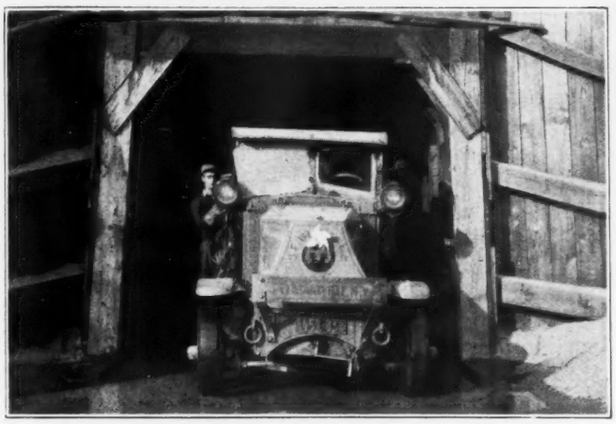
method of disposing of the bulk of the sand with the least possible amount of handling contributes largely to the economy of the operation and leaves the bins for the gravel.

The coarse material from the ¼-in. flat screen, at the discharge of the pipe-line, drops to the boot of a Good Roads belt-bucket elevator which takes it to the top of the screening plant. Here it discharges into a 4-ft. by 20-ft. Good Roads revolving screen with ½-in., ¾-in. and 1¼-in. perforations and a 5-ft. wire-cloth sand-jacket with ¼-in. mesh. The sand is chuted into the concrete-sand boxes while the three sizes of gravel go directly into bins. The gravel over 1½-in. is chuted to a 50-cu. yd. bin.

This feeds, through a rack-and-pinion gate, into the Climax No. 2½, 10-in. by 20-in. jaw crusher. This discharges onto a 20-in. inclined belt conveyor on 40-ft. centers which, in turn, discharges through a chute into the elevator to the sizing screen. The stone caught in the trap on the dredge is loaded onto a truck and is dumped onto a platform, from which it is shoveled into a Good Roads chain-bucket elevator. This discharges through a chute to the crusher.

The timber bin supporting the screening plant has three compartments. Two of these have a capacity of 100 cu. yd. each and are used for pea gravel and ¾-in. gravel. Only one-half the third bin is used for the 1¼-in. gravel, the other half being used for the oversize gravel.

Trucks are loaded on one side of the plant only,



Truck loading in tunnel beneath the sand stock-piles.

through side-discharge gates. A Link-Belt stock-pile loader, powered with a Buda gasoline engine, is used to recover dead stock-piled material.

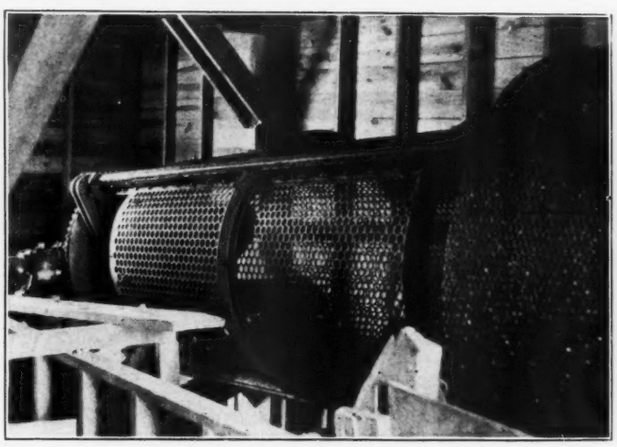
The belt conveyors have Dodge-Timken roller-bearing idlers and Goodyear conveyor belting. Each of the two stock-piling conveyors is belt-driven by a 20-hp. motor, and the conveyor from the crusher by a 5-hp. motor. The jaw crusher is belt-driven by a 30-hp. motor, and the screen and the first elevator are belt-driven, from a single line-shaft, by another motor. Each of the three sand-boxes is driven through a Foote spur-gear speed re-

Left to right: C. W. Maxwell, president; R. C. Delaney, secretary; and A. D. Spink, superintendent.

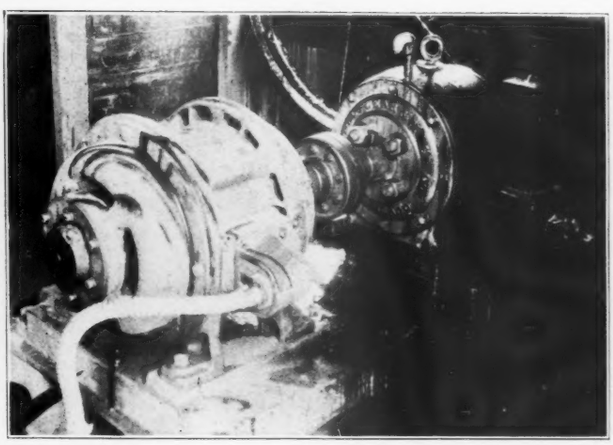
ducer by a 7½-hp. motor. All drive belts were furnished by the Boston Woven Hose & Rubber Co. Crouse-Hinds conduit and Bulldog safety switches are used exclusively. W. S. Tyler Tyloy ¼-in.-mesh wire-screen cloth is used at the dredge discharge and on the sand-jacket of the revolving screen. All motors and most of the electrical equipment were furnished by the General Electric Co.

At present, truck shipments only are being made but, by installing a few hundred feet of sidetrack, rail shipments could be made as well. The company owns one Pierce-Arrow truck, hiring other trucks as needed, and expects to purchase a number of others next spring.

Only four men are required to operate the plant at capacity. These include the dredge operator, one man about the plant, one in the tunnel when loading trucks, and one blacksmith.



Revolving screen equipped with sand jacket.



Motor and speed reducer driving one of the sand drags.

Profits Accruing From Dust Control in the Pit and Quarry Industries

By E. H. de CONINGH
Technical Editor, The Dust Recovery & Conveying Co.

ATMOSPHERIC dust has been a nuisance since man took up a fixed abode, and the nuisance increased with the early progress of industry. As long ago as 1661 John Evelyn complained of "the hellish cloud of sea-borne coal which maketh the city of London resemble the suburbs of hell!" The advent of the machine age continued to concentrate dust in the industrial areas, but there is reason to hope that the wider use of present dust-control equipment and the development of better equipment may lead to steady improvement.

Although dust and fume discharge now occur in gases of a wide range of compositions and conditions, there is available equipment to remove the solids from even the worst cases. Mechanical collectors, most of which incorporate the cyclone principle in one form or another, show a good recovery on coarse dust, and up to 75 per cent on reasonably fine material. Spray collectors and wet washers are in somewhat the same category, and when enlarged and developed to the extent of the blast-furnace gas scrubber, can effect a high efficiency of dust recovery. For high-efficiency, dry collection of fine dust two types of equipment are available—electrical precipitators, which are preëminently suited to such applications as acid mists; and fabric filters, which function best on dust or on fume-bearing gases which do not carry free moisture.

Dust is created, and equipment to recover it is available. What are the inducements to bring the two together in a particular instance? In other words, what profit is there to be derived from dust control?

The tangible, visible profit that can be measured in terms of dollars is the recovered by-product whose particles form the dust cloud. The value of this dust depends upon its composition, fineness, and condition, and may vary from little or nothing to a unit value much greater than the material of which it constitutes a by-product. One feature of dust loss which bears emphasis in this connection is the high value of many materials in the form of dust, where grinding is a part of the process. It generally costs more to pulverize a material from 20-mesh fineness to 300-mesh, than it does from the largest size to 20-mesh. And the dust loss always occurs from the finest and most valuable material, after it has taken its due of wear and power from every machine in the production line.

The second profit from dust control is represented by the improvement in conditions inside and outside the plant. A recent article has characterized dust as a cause of ill health; a contributor to the maintenance of a low social status and lack of self-respect; and an obstacle to efficient plant operation. No one can deny the truth of this indictment, and the means to remove such an evil must be credited with the production of a substantial non-monetary income.

The dusts which are being and can be collected in the pit and quarry industries are as varied as the materials which are handled. The illustrations which accompany this article show a few adaptions of recovery equipment to dust problems either in these or in allied fields.

Coal dust from coal preparation plants has become a serious nuisance, especially where pulverized coal is being prepared, and the coal dust, when recovered, has a definite value. Fig. 1 gives an idea of the dust cloud in the excess air from the cyclone vents in the air separation systems of a public-service corporation, and Fig. 2 is a visual check on the high efficiency of collection produced by fabric filters. About one ton of coal dust per hour is reclaimed, which is an average of four-fifths of one per cent of the coal ground. While the coal prepara-

Fig. 1. Coal-pulverizing building before dust collectors were used.

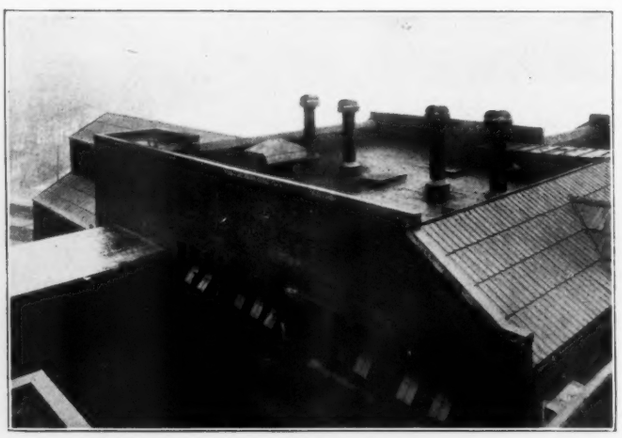


Fig. 2. The same building after fabric filters were installed.

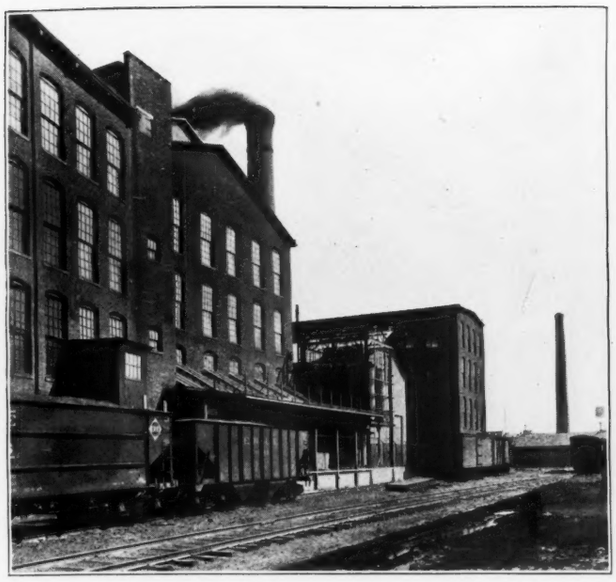


Fig. 3. Stack discharge when burning pulverized coal for fuel.

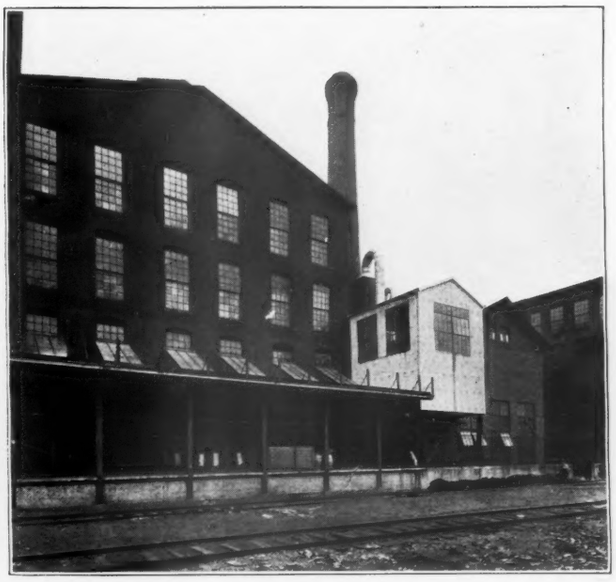


Fig. 4. Dust collectors suppressed the discharge of solid matter.

tion plants in the cement and allied industries handle usually a smaller volume of coal, the percentage reclamation possible is just as great.

Another aspect of power-plant operation is the nuisance caused by fly-ash discharge from pulverized-fuel-burning boilers. The improved efficiency from this type of equipment led to many installations, without full realization of the volume of stack discharge which would result. Plants operating in metropolitan districts have been faced with the necessity of collecting the entrained ash and soot, as the public has come to recognize where the responsibility rests. Figs. 3 and 4 show graphically the complete elimination of stack discharge that is possible with high-efficiency collectors. The recovered material in this case has no value whatever but, without this or equivalent collecting equipment, the surrounding property owners could have enjoined the plant from operating.

In stone-crushing plants, dust collectors have been demonstrated to be definitely profitable from a recovered-material basis. Fig. 5 shows the arrangement of air filters in a crusher plant making crushed limestone to recover the dust from gyratory crushers, scalping screens, and chutes to storage bins. Enough dust, sold as agricultural limestone, was recovered, to pay a good profit on the installation, while the dust-free stone produced commanded a special bonus. In this case, the improvement in plant conditions has cost nothing, and is merely an added credit to the account of the recovery equipment.

Figs. 6 and 7 show another example of the improvement effected by high-efficiency collectors as a part of pulverizing equipment. Fig. 6 is a photograph of the dust discharged in the excess air from mill cyclones on air-swept pulverizers operating on phosphate rock. After a number of experiments with mechanical collectors, fabric filters were installed, one unit for two mills, as shown in Fig. 7. All the dust is collected and returned to process and, to quote the operators "the 0.2-per cent recovery of product formerly lost has proved a distinct increment in the overall efficiency of the plant."

These are a few concrete examples of profitable installations of dust-control equipment. In almost every case, the operators attach greater importance to the intangible improvement in plant conditions and worker morale than to the actual dollar value of the recovered product.

The lay public is gradually awakening to the facts of atmospheric pollution, as more and more discus-

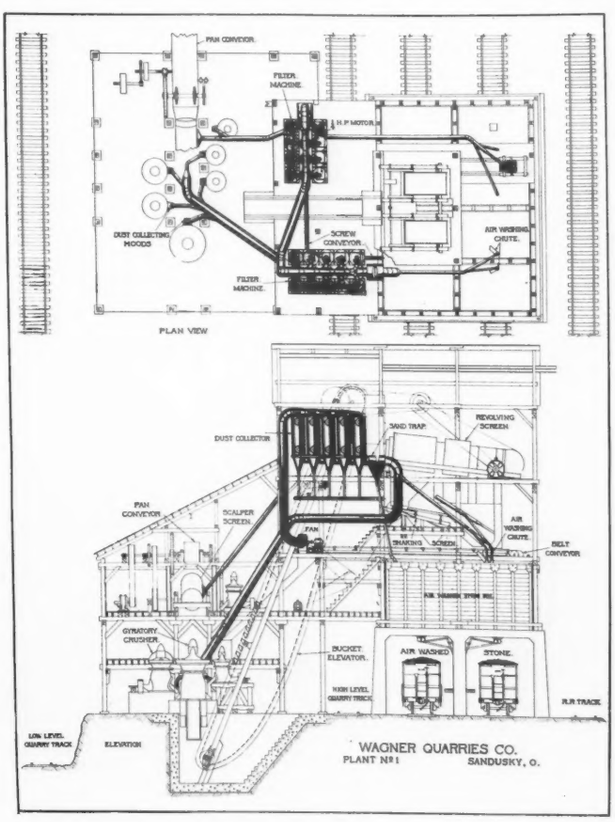


Fig. 5. Arrangement of air filters in a stone-crushing plant in Ohio.

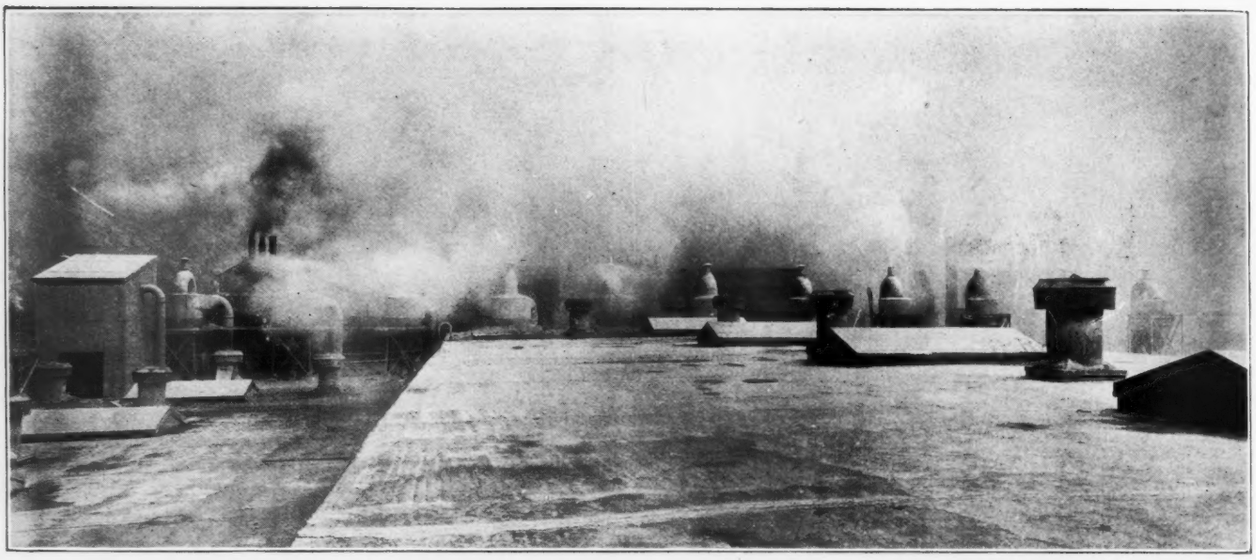


Fig. 6. Phosphate-rock dust discharged from air-swept pulverizers.

sion is appearing in current periodicals and the daily press, and the inevitable result of public understanding of actual conditions will be a demand for dust-and-fume collection at the source of origin. Dr. MacLaurin, trade waste commissioner of Cleveland, has shown that a cubic foot of city air contains an average of about 0.0004 grains of solid matter. The solids in the stack discharge from a pulverized-fuel-burning boiler frequently amount to four grains per cubic foot, so it is obvious that 10,000 times as great a volume of air must be filtered to collect the solids after partial dilution in the atmosphere, as against a collector at the power-plant stack. The same reasoning applies, though perhaps to a less degree, to the dust discharge from pit and quarry industry operations.

To anticipate voluntarily what will eventually come as a requirement is a far-sighted policy that will prove of great value. Public opinion will applaud the plant which acts to improve conditions now, while it will condemn the last to fall in line. The experience of a manufacturer in a middle western city provides an excellent example of the danger that may exist in dust discharge. His process involved the grinding of a material, the dust from which was finally proved to cause asthmatic irritation. But before this was discovered, an epidemic of asthma disturbed the neighborhood and received city-wide attention in the press. As soon as responsibility was fixed, filtering equipment was installed, which completely eliminated the dust discharge and removed any possible source of irritation. But this plant is so firmly fixed in the mind of the neighboring public as a source of trouble, that responsibility for every case of asthma in the suburb is laid at its door, and damage suits are still being instituted. Equal attention to the situation earlier would have turned the costly and unpleasant publicity into praise, while now a defense before the court and public is continually required for conditions which are, in fact, completely dustless and sanitary.

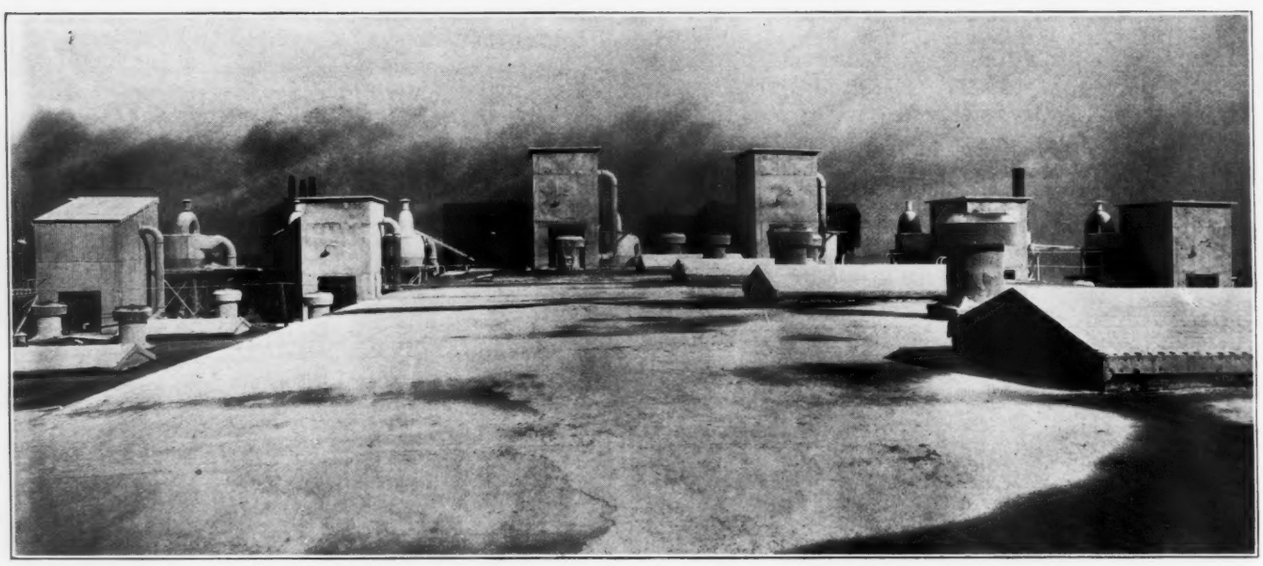


Fig. 7. The same plant in Fig. 6 after installing fabric filter collectors.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

© Blank-Stoller, Inc.

G. H. TARBELL
Production Manager
National Gypsum Co.
Buffalo, N. Y.

Personal Mention

C. E. Ellsworth, who has been chief engineer of the construction division, National Lime Assn., has resigned.

R. Royal Roane, well-known marine and hydraulic engineer, has opened a consulting practice with offices at Jersey City, N. J. Mr. Roane will specialize in dredge design and other marine work. He has a background of 30 years of diversified experience in general engineering practice.

H. D. Lidstone has been appointed superintendent of the Charleston Mining and Mfg. Co., Mt. Pleasant, Tenn.

J. Larson, Jr., has been appointed general traffic manager; **H. R. Paul,** assistant traffic manager, and **A. L. Swanson,** credit manager of the Masonite Corp., it is announced by **R. G. Wallace,** general sales manager.

E. K. Smith, assistant to the manager, highways bureau, Portland Cement Assn., Chicago, was married on Nov. 20 to Miss Arline Miller of Bloomingdale, Mich. Mr. and Mrs. Smith left immediately after the wedding ceremonies on a honeymoon trip to Montreal. The marriage was the culmination of a romance which began several years ago when the bride was a stenographer in the Portland Cement Assn. offices. Mr. Smith has been connected with the association for more than six years. He was formerly in the city engineering department at Beloit, Wis.

R. W. Stone, assistant state geologist of Pennsylvania, and **F. H. Wood,** of Harrisburg, Pa., sailed from New York on Oct. 11, for Colombia, where they will be engaged in geologic and engineering work near Bogota for about six weeks.

Dr. Scott Turner, director of the U. S. Bureau of Mines, was recently given the honorary degree of Doctor of Engineering by the University of Michigan, of which institution he is a graduate.

J. L. Von Glahn of Spartanburg, S. C., has opened a crushed-stone plant and quarry near that city. Machinery has been installed and given a test run. Production schedules call for 50 tons daily.

Kent B. Diehl has been promoted by the Ash Grove Lime & Portland Cement Co. to the position of director of sales of "Quickard," an early setting cement, with headquarters at Kansas City, Mo. **John J. Mitchell** succeeds Mr. Diehl in charge of the Chicago offices.

Platt B. Walker, Jr., has been appoined sales representative at St. Paul for the Dewey Portland Cement Co.

Wharton Clay, successively sales engineer of the United States Gypsum Co., commissioner of the Associated Metal Lath Manufacturers, and organizer of the National Council for Better Plastering, has joined the service department of the Truscon Steel Co., Youngstown, O.

W. S. Stewart, who has been in charge of the Pacific Coast offices of the Lincoln Electric Co., Cleveland, O., has been made district manager in charge of the Cleveland territory. He has been identified with the company since his graduation from Yale University.

Frank W. Lovett.

Frank W. Lovett has been appointed engineer in charge of sewage disposal equipment in the Western territory by Link-Belt Co., Philadelphia.

Mr. Lovett is located at the company's plant office, 300 W. Pershing Road, Chicago, and his services are available to sewage-disposal plant engineers and managers. His thirteen years with Link-Belt Co., eight of which have been in the designing of machinery for sewage treatment plants, enables him to cover the subject quite thoroughly.

A. R. Abelt has been elected secretary of the Chain Belt Co. of Milwaukee, Wis. Mr. Abelt has been with the company for 24 years, and for the past eight years has been in charge of chain sales. He will continue to direct the sales of chain, a basic division of the company.

Peter F. Gray, representative at Lansing, Mich., for the Petoskey Portland Cement Co., has been elected mayor of Lansing. Mr. Gray ran on the Democratic ticket.

Mrs. A. H. S. Davis has leased her granite holdings at Cedar Rock, Ga., to McCook & Co. for a 10-year term. Operations to produce crushed granite are to start shortly.

A. A. Wilmot has been appointed assistant sales manager in charge of structural products at the Chicago office of the Wickwire Spencer Steel Co. Mr. Wilmot has been a member of the New York sales department of the company for the past five years. **G. L. Crawford,** who has been a member of the Chicago sales staff for the past four years, has been appointed assistant sales manager in charge of structural products at the company's office in Tulsa, Okla.

F. G. Cottrell has resigned as director of the Fixed Nitrogen Research Laboratory and assumes a consulting relation to that division of the Bureau of Chemistry and Soils. Dr. Cottrell is to devote a substantial part of his time to other investigations, including work in coöperation with the Smithsonian Institution. Dr. Cottrell is well known in the non-metallic mineral industries for his work in developing dust collection by electrical precipitation.

Obituary

Henry Harnischfeger, president of the Harnischfeger Corp., Milwaukee, died suddenly on Nov. 15 from a heart attack at his home while preparing to go to his office. Mr. Harnischfeger was born 75 years ago in Germany and came to America as a boy of 16.

Edward C. Waldvogel, director and vice-president of The Yale & Towne Mfg. Co., passed away at his residence in New Rochelle, N. Y., on November 13. Death was due to pneumonia. Mr. Waldvogel was born in Toledo, O., and entered the Yale service in 1905 as a salesman. In 1910 he was transferred to New York as assistant to the general manager. He succeeded Walter C. Allen, the present president of the company, as general manager in 1916.

Michael A. Shea, head of the granite firm of W. Shea & Son, Quincy, Mass., died recently. He was a member of the Granite Manufacturers' Assn. and a delegation from the association attended the last rites.

Joseph Schmidt, retired president of the Schmidt Stone Co., South Bend, Ind., died early last month in his winter home at Lakeworth, Fla., after a brief illness.

L. G. Gerhardt, sales manager of the Gypsum Products Corp., Seattle, Wash., died Nov. 7, after a long illness. The deceased was a native of Michigan and was graduated from the state universities of Washington and Utah. He was 37 years old.

Coming Events

Dec. 1-5, 1930, Memphis, Tenn. Ninth Annual Asphalt Paving Conference of the Asphalt Institute. Meeting of the Association of Asphalt Paving Technologists in conjunction.

Dec. 1-6, 1930, New York, N. Y. Ninth National Exposition of Power and Mechanical Engineering, to be held at Grand Central Palace. I. E. Moultrop, chairman.

Dec. 11-12, 1930, Washington, D. C. Special meeting, Highway Research Board of National Research Council.

January 9-10, St. Louis, Mo. Annual convention, National Assn. of Paris Transit-Mixed Concrete Manufacturers. E. A. Landis, executive secretary, Portland, Ore.

Jan. 12-16, 1931, St. Louis, Mo. Annual convention and show, American Road Builders' Assn. Chas. M. Upham, engineer-director, National Press Bldg., Washington, D. C.

Jan. 19-22, 1931, St. Louis, Mo. Annual Convention National Crushed Stone Assn., Hotel Jefferson. J. R. Boyd, secretary, 1735 14th St., N. W., Washington, D. C.

Jan. 26, 1931, St. Louis, Mo. Annual convention of National Ready-Mixed Concrete Assn. New Hotel Jefferson. J. C. Eakin, secretary, Little Rock, Ark.

Jan. 27-29, 1931, St. Louis, Mo. Annual convention National Sand & Gravel Assn., Hotel Jefferson. V. P. Ahearn, executive secretary, Washington, D. C.

Feb. 10-13, 1931, Chicago, Ill. Fifth Midwest Power Engineering Conference. G. E. Pfisterer, secretary, 308 W. Washington St., Chicago.

Feb. 24-27, 1931, Wichita, Kan. Sixth Annual Southwest Road Show and School, Exposition Building. F. G. Wieland, manager, P. O. Box 1043, Wichita, Kan.

April 13-18, 1931. Cleveland, O. National Industrial Equipment Exposition, in connection with Congress on management, maintenance and materials-handling of A. S. M. E. G. E. Pfisterer, managing director, 308 W. Washington St., Chicago, Ill.

May 4, 1931. New York, N. Y. Thirteenth exposition of Chemical Industries, Grand Central Palace. International Exposition Co., managers, Grand Central Palace, New York.

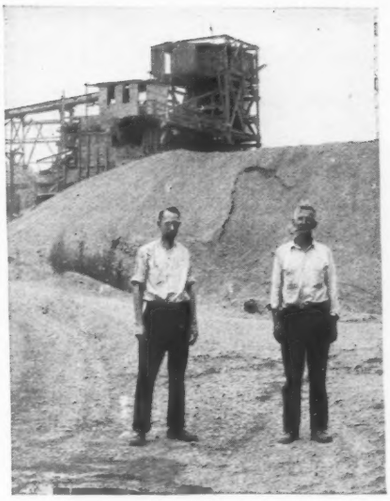
Adopts Power Shovel for Loading to Avoid Undesired Mixtures

UNTIL recently the Mahoning Valley Sand Co., West Pittsburgh, Pa., had been producing sand and gravel with the aid of a drag-scraper excavator. The use of this type of excavator, equipped with a bucket of the so-called drag-scraper type, is probably one of the most popular and economical methods of producing this class of material, especially in a small plant.

Where the bank deposit is of proper quality, the drag-scraper excavator can operate on a radius of several hundred feet, dragging material into a receiving hopper, from which it is transported by various means to the plant. The operation of this type of excavator, however, is somewhat limited as to output, unless confined to a rather small area. Furthermore, it is more or less difficult to avoid mixing clay and loam, when such deposits are encountered in the pit, with the sand and gravel.

Such a condition confronted the Mahoning Valley Sand Co. Therefore, R. B. Cowher, president and general manager, decided to adopt the power-shovel-loading method. It was natural for him to turn to Link-Belt Co., since his sizing and washing plant is Link-Belt completely equipped.

A K-25 heavy-duty gasoline crawler shovel, equipped with ⅞-cu. yd. capacity dipper, was installed in the pit in June, 1930, the change from the drag scraper method to the shovel method of loading having been made without any loss of plant-operating time. A 36-in. gauge industrial-railway system with a 3½-ton Plymouth gasoline locomotive and two 6-cu. yd.-capacity Koppel two-way side-dump cars were also installed, to transport the material from the shovel to the field hopper, a distance of approximately 700 ft.



Ralph Zell and R. B. Cowher.

From the field hopper, which has a capacity of about 20 cu. yd., the material is fed onto a 24-in. Link-Belt belt conveyor which delivers it to the top of the plant, where the material is sized, washed and dewatered before shipping.

The plant has a handling capacity of 1,200 tons a day. The K-25 crawler gas shovel, with a fuel consumption of about 40 gal. per day, very readily loads sufficient material into the 6-cu. yd. Koppel cars, in the pit, to keep the plant operating at its full capacity.

The Mahoning Valley plant is served by the Baltimore & Ohio and the Buffalo, Rochester & Pittsburgh Railways over which rail shipments are made, although approximately 50 per cent of the output is loaded directly into delivery trucks and hauled away.

The company's officers are: R. B. Cowher, president and general manager; H. C. Thompson, treasurer-secretary; Earl Childers, vice-president; and Ralph Zell, assistant secretary-treasurer.

Gasoline crawler-mounted shovel, gasoline locomotive, and side-dump cars.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Raybestos Net for Nine Months $1.41 per Share

Raybestos-Manhattan, Inc., reports for the nine months ended Sept. 30, 1930, a net profit of $951,976 after inventory adjustments, depreciation and federal taxes, equivalent to $1.41 per share on 676,012 no-par shares of common stock. This compares with $3,108,919 or $4.60 per share in the first nine months of the previous year.

The net profit for the September quarter was $126,477 after above charges, equal to 19 cents per share on 676,012 shares; comparing with $374,524 or 55 cents per share on 675,007 shares in the preceding quarter, and $1,010,390 or $1.49 per share on 676,012 shares in the third quarter of 1929.

The income account for the nine months ended Sept. 30, 1930, compares as follows:

	1930	1929
Net sales	$13,506,762	$18,812,492
Net after tax and inventory adjustment	1,359,837	3,564,753
Depreciation	407,861	455,834
Net profit	$ 951,976	$ 3,108,919

The income account for the quarter ended September 30, 1930, shows: Net sales, $3,935,311; net after taxes and inventory adjustments, $260,983; depreciation, $134,506; net profit $126,477.

As of Sept. 30, 1930, the total assets of Raybestos-Manhattan, Inc., amounted to $18,994,074, against which there were no bank loans, funded debt or other capital obligations other than common stock. Current assets, including cash, bonds and other marketable securities aggregating $3,737,257, were $9,445,854, or approximately 11¾ times current liabilities of $804,533. The company had in cash and readily marketable securities, representing the investment of surplus cash, enough to meet its dividend requirements for two years. The book value of the company's stock was $25.90 per share, without including the reserve for contingencies. Of this value, $13.97 per share was represented by current assets.

The company states that no part of the reserve for contingencies, of which $425,000 was set up specifically to provide for inventory adjustments, was utilized during the period.

Consumers Co. to Offer Rights to Stockholders

Common stockholders of record Nov. 21, of Consumers Co. will be offered the right to purchase one additional share of common stock at $5 per share for each two shares held. Rights will expire Dec. 20.

The company declared the regular quarterly dividend of $1.50 on the prior preferred stock, payable Jan. 1, 1931, to holders of record Dec. 15, 1930. The time limit of purchase-warrants allowing the buying of one voting trust-certificate representing one share of common stock at $5 which was to have expired January 1, 1931, has been extended to January 1, 1933.

Management of Asbestos Corporation Supported

The report of Stuart, James & Cook, New York engineers, on the situation of Asbestos Corp. which was prepared on the recommendation of the general mortgage bondholders, supports the work of the present management. After pointing out that fibre prices have gone down and that the present year is one of business depression, the report expresses the belief that the present management can work out a solution of the company's problems if a not too burdensome capital structure is set up and that capital is provided to permit finding and development of suitable mill rock. Confidence is expressed that the ordinary cycle of business will return the asbestos industry to a normal basis.

The engineers find that the sales department needs reorganization and recommend the formation of an association within the Canadian asbestos industry where a bureau of statistics should function. Need for such an association becomes the more vital, it is said, as African and Russian production of asbestos increases.

Colorado Lime Operator Merges with Coal Firm

Through a series of transactions just completed at Pueblo, Colo., the interests of the Pueblo Lime Co. and the Thomas & Brown Coal & Brokerage Co. have been merged into one business, headed by W. N. Thomas and to be known as the Thomas Coal & Lime Co. The combining of the two firms will place the huge lime kilns just north of the Eighth street viaduct in Pueblo into control of the Thomas Coal & Lime Co.

California Silica Sand Producers Consolidate

A merger of silica-sand interests at Felton, Cal., and Stockton, Cal., to be known as the Atlas Olympia Co., Ltd., with headquarters at San Francisco, has been announced. Extensive improvements are planned, including equipment for the recovery of silicious silt. New railroad spurs are already under construction at the plants in both towns.

Improvements to Double Mexican Mill's Capacity

Improvements costing 750,000 pesos (about $375,000) are in progress at the plant of the Monterrey Portland Cement Co. in Mexico. When the new additions are complete, the plant's capacity will be doubled, enabling production at the rate of about 2,000 tons daily.

CURRENT DIVIDENDS

Company	Class of Stock	Dividend Rate	Holders of Record	Payable	Company	Class of Stock	Dividend Rate	Holders of Record	Payable
Alpha Portland Cement	Preferred	1¾% qr.	Dec. 1	Dec. 15	National Brick of Laprarie	Preferred	$0.75 qr.	Nov. 31	Dec. 15
Canada Cement	Preferred	1⅝% qr.	Nov. 28	Dec. 30	Newago Portland Cement	Preferred	$1.75 qr.	Dec. 26	Dec. 30
Canada Paving and Supply	1st Pfd.	1¾% qr.	Nov. 15	Dec. 1	New York Trap Rock	Preferred	$1.75 qr.	Dec. 20	Jan. 1
Cleveland Stone Quarries	Common	$0.75 qr.	Nov. 15	Dec. 1	Peerless Cement	Preferred	$1.75 qr.	Dec. 20	Dec. 30
Cleveland Builders Supply	Common	$0.50 qr.	Dec. 15	Jan. 1	Raybestos Manhattan	Common	$0.65 qr.	Nov. 30	Dec. 15
Consolidated Sand and Gravel	Preferred	1¾% qr.	Oct. 30	Nov. 15	Standard Paving and Materials, Ltd	Preferred	1¾% qr.	Nov. 2	Nov. 15
Consumers Co	Pr. Pfd.	$1.50 qr.	Dec. 15	Jan. 1	Standard Paving and Materials, Ltd	Common	$0.50 qr.	Nov. 2	Nov. 15
General Asphalt	Common	$0.75 qr.	Dec. 1	Dec. 15	Superior Portland Cement	Class A	$0.27½ M.	Nov. 23	Dec. 1
Indiana Limestone	Preferred	1¾% qr.	Nov. 20	Dec. 1	Texas Gulf Sulphur		$1.00 qr.	Dec. 3	Dec. 15
International Cement	Common	$1.00 qr.	Dec. 11	Dec. 30	United States Gypsum	Preferred	$1.75 qr.	Dec. 15	Dec. 30
International Salt	Common	$0.75 qr.	Dec. 15	Jan. 1	United States Gypsum	Common	$0.40 qr.	Dec. 15	Dec. 30
Johns Manville	Preferred	$1.75 qr.	Dec. 11	Jan. 1	Virginia Carolina Chemical	Pr. Pfd.	1¾% qr.	Nov. 17	Dec. 1
Johns Manville	Common	$0.75 qr.	Dec. 25	Jan. 15	Wolverine Portland Cement		$0.15 qr.	Nov. 5	Nov. 15
Kentucky Rock Asphalt	Preferred	1¾% qr.	Nov. 15	Dec. 3	Worcester Salt	Preferred	1½% qr.	Nov. 10	Nov. 15
Lawrence Portland Cement		1% qr.	Nov. 31	Dec. 15					
Material Service Corp		$0.50 qr.	Nov. 15	Dec. 1					
Metropolitan Paving Brick	Common	$0.50 qr.	Nov. 15	Dec. 1					

Traffic News and Comment

Recent I. C. C. Decisions

Cement

The Commission has decided that the rate on cement in carloads from Stroh, Ind., to Ellison's Siding, Ind., via an interstate route, is unreasonable to the extent that it exceeds 9.5 cents, and reparation has been awarded on 19 carloads that have moved. I.C.C. Docket No. 22,236, Wabash Portland Cement Co. v. Indiana Service Corporation et al.

The rate on cement from Louisville, Neb., to St. Paul and Minnesota Transfer, Minn., is and will be unreasonable to the extent that it exceeds or may exceed 16 cents per 100 lb. The commission has ordered the carriers to publish rates not to exceed this finding, to be effective not later than Jan. 26th, 1931. I.C.C. Docket No. 22,239, Ash Grove Lime & Portland Cement Co. of Nebraska v. C. & N. W. et al.

Granite and Marble

The Complaint of A. E. Staley Manufacturing Co. v. A. & Y. et al., has been dismissed, the commission having found the rate on granite from Mt. Airy, N. C., to Decatur, Ill., not unreasonable or otherwise unlawful. I.C.C. Docket No. 22,798.

Reparation has been awarded on shipments of rough-quarried marble blocks from points within the lighterage limits of New York Harbor and Port Morris, N. Y., to Chicago and Peoria, Ill. and Milwaukee, Wis. The rates were found unreasonable in a former report and it was after a further hearing that reparation was awarded. I.C.C. Docket No. 19,427, Henry Marble Co. et al. v. B. & O. et al.

Sand and Gravel

New rates on sand from Shirk, Okla., to Lamar, Golden City, Wheaton, and Lockwood, Mo., have been prescribed to be made effective not later than Jan. 26th, 1931. Basis for the new rates is the scale published in Appendix 2, in report 155, I.C.C. 247, Sand, Gravel, Crushed Stone and Shells. The maximum rates prescribed are 7 cents to Wheaton, and 8 cents to Lamar, Golden City and Oakwood. The rates are unduly prejudicial to the complainant and unduly preferential of the competitors at Wichita, Kan., and Kansas City, Mo., to the extent that they exceed the scale mentioned, and reparation has been awarded. The findings are without prejudice to any different conclusions that may be reached in I.C.C. Docket No. 17,000, Part 11-A, which is now pending. I.C.C. Docket No. 22,785, W. E. Rogers v. M. & N. A. et al.

A mileage scale of rates on sand and gravel, has been prescribed from Gladstone, Ill., to points on the C. B. & Q., in southeastern Iowa. The scale rate is 65 cents for 20 miles and graduated to $1.30 for 150 miles. The scale will be published in detail in a subsequent issue of PIT AND QUARRY, together with other scales used in making rates on sand and gravel. The rates in effect were declared unreasonable, but reparation was denied as complainant failed to show damages. I.C.C. Docket No. 22,791, Terry & Lewis Sand & Gravel Co., Inc. v. C. B. & Q.

Examiner's Reports

Ground Limestone

The New Castle Lime & Stone Co. has a peculiar situation at its Shaw Junction, Pa., plant; for, while the plant is located in the state of Pennsylvania, it is so situated near the state line that shipments going to destinations in Pennsylvania must move into Ohio for a distance of about three miles and then back into Pennsylvania, thus bringing the rates out of the jurisdiction of the Pennsylvania Commission. A scale of rates on ground limestone for intrastate use had been prescribed by the state commission, but, on account of the interstate movement, the commission could not order the carriers to make this scale applicable from Shaw Junction. Examiner Konigsberg reports that the state scale is on a lower basis than the rates now in effect from Shaw Junction and that the commission should find the rates from Shaw Junction to destinations in Pennsylvania unduly prejudicial to complainants and unduly preferential of complainant's competitors at points in Pennsylvania, to the extent that they exceed the Pennsylvania scale.

Complainants also attacked the rates in effect from Bellefonte, Pa., Buffalo, N. Y., Martinsburg, W. Va., Greer, W. Va., Gibsonburg, O., and Marble Cliff, O., charging that rates from Shaw Junction to points in Pennsylvania, New York, Maryland and West Virginia were unreasonable, unduly prejudicial to the complainants and unduly preferential of competitors located at the above producing points. Various producers at the competitive points mentioned intervened. Many exhibits were presented showing representative rates and ton-mile earnings from the points involved, and indicating that there is no established basis for making interstate rates on this commodity. Some of the shippers had hoped that a definite basis for making such rates would be prescribed by the commission in this case, probably in the form of a mileage scale, but the examiner has not seen the advisability of proposing such a basis. He says that the record did not warrant a finding that the rates from Shaw Junction were in excess of reasonable maxima or were unduly prejudicial as complained.

As complainants have not made proof of damages as required for the award of reparation, the examiner said the commission should deny reparation. I.C.C. Docket No. 23,068, New Castle Lime & Stone Co. et al. v. Aliquippa & Southern et al.

New Complaints Filed

Cement

Rates on cement from San Antonio, Tex., to destinations in New Mexico, not to exceed the rates shown in Scale 4 in the decision of the commission in Docket No. 15,151, have been asked by San Antonio Portland Cement Co. in its complaint against the I. G. N. et al. The cement company charges that the present rates are unreasonable. I.C.C. Docket No. 23,995.

Feldspar

The rates on ground feldspar from Cane Branch, N. C., to Knoxville, Tenn., are alleged unreasonable, and new rates and reparation have been asked in I.C.C. Docket No. 23,983, Knox Porcelain Corp., Knoxville, Tenn. v. Black Mountain, et al.

Granite

Reparation and reasonable rates have been asked on rough granite from East Weymouth, Mass., to the following destinations in New York: Ossining, Scarboro, Peekskill and Croton-on-Hudson. I.C.C. Docket No. 23,945, Plymouth Quarries, Inc., Weymouth, Mass. v. N. Y. N. H. & H., et al.

Marble

A complaint of unreasonableness is made on the rates on marble, from points in Vermont to destinations in New York, Pennsylvania, Maryland, New Jersey, Delaware, Virginia, West Virginia, Ohio, Indiana, Michigan, Illinois and the District of Columbia. Reasonable rates for the future are asked. I.C.C. Docket No. 23,610, Sub. No. 1, Vermont Marble Co., Proctor, Vt. v. D. & H., et al.

Rate Committee Dockets

NEW ENGLAND FREIGHT ASSN.

Dolomite

As no burnt dolomite is shipped from points on the N. Y., N. H. & H. R. R., the carriers propose cancelling the commodity rates from points on that road to points in Trunk Line Assn. territory in New Haven tariff. I.C.C. F-3,065. Docket No. 21,217.

Sand

To meet motor-truck competition, the carriers are proposing a reduction

of the rate on sand (building, common or run-of-bank), min. wt. 90 per cent of marked capacity of car, from Avon, Conn. to Danbury, Conn. The present rate is 90 cents per net ton, and the proposed rate 75 cents. Docket No. 21,176.

TRUNK LINE ASSN.

Cement

Increases in cement rates are proposed by the New Haven Railroad from Alsen and Binnewater, N. Y. The proposed rates in docket No. 25,006, Sup. 1, per 100 lb. are:

From Alsen, N. Y., to	Cents
Great Harrington, Mass.	11½
Van Deusenville	11½

From Binnewater, N. Y., to	Cents
State Line, Mass.	11½
Westfield	13
Holyoke	13
Southampton	13
Easthampton	13
Northampton	13
Florence	13½
Leeds	13½
Haydenville	13½
Williamsburg	13½
Hatfield	13
Whately	13
South Deerfield	13
Deerfield	13
Turners Falls	13
Fitchburg	14½
South Fitchburg	14½
Sherborn	15
South Sherborn	15
Medfield Junction	15
Rouses Point, N. Y.	16
East Swanton, Vt.	16

Shippers have asked for rates on cement from Binnewater and Brixment, N. Y. to various destinations in Maryland on the same basis as other rates now applicable between points in trunkline territory. The present rates range from 27½ cents to 33½ cents per 100 lb., and the proposed rates from 17 cents to 19½ cents per 100 lb. Docket No. 25,234.

Shippers have asked for commodity rates on cement from Brixment, N. Y. to Alburgh Springs and East Alburgh, Vt. of 21 cents per 100 lb. Docket No. 25,240.

Lime

Commodity rates are proposed by a shipper at Staunton, Va. on lime (common, hydrated, quick or slacked) in packages or in bulk, carloads, min. wt. 30,000 lb., in Docket No. 25,191. The rates requested are: to Pembroke, Pa., $2.70; Swedesboro, Salem, Elmer, and Vineland, N. J., $3.70; Irvington, Newark, Mt. Holly, Merchantville, N. J., Doylestown, Lansdale, Nanticoke, Kingstown, Scranton, Wilkes-Barre and Allentown, Pa., $3.80; and Atlantic City, N. J., $4.10 per net ton.

A rate of 70 cents per net ton on broken stone, carload min. wt. 90 per cent of marked capacity of car, from Devault, Pa. to Plymouth Meeting, Pa., has been proposed by a shipper. This rate is comparable with others involving like hauls. The present rate is 80 cents per net ton. Docket No. 25,184.

Rates from Jamesville, N. Y. have been requested on trap rock, lime rock, broken stone and stone screenings, in bulk, carload min. wt. 90 per cent of marked capacity of car, except when car is loaded to actual or visible capacity, actual weight to apply, as follows: Alford, Pa., $1.10; Kingsley, Foster, Nicholson, Factoryville, La-Plume, Dalton, Glenburn, Clarks Summit, Pa., $1.20; Scranton, Nay Aug, Elmhurst, Moscow, Hollisters, Pa., $1.30; Lehigh, Gouldsboro, Tobyhanna, Pocono Summit, Mountain Home and Cresco, Pa., $1.40 per net ton. Docket No. 25,222.

Crushed Stone

Shippers are asking for rates on crushed stone from Worthington, Pa. to destinations on the Pittsburgh & Shawmut, based on the West Penn Scale, P. S. C., Pa., Docket 6951. Rates requested in Docket No. 25,155 per net ton are:

Smith Summit, Pa.	90 cents
Ramsaytown	80 cents
Timblin	70 cents
Furnace Run	60 cents
Freeport Jct.	70 cents
Kittanning	60 cents

The following rates are requested by shippers to apply from Bethlehem, Pa. Column A rates are to apply on crushed stone and Column B rates on crushed stone, coated with oil, tar or asphaltum, min. wt. 90 per cent of marked capacity of car. Docket No. 25,176.

To	A	B
York, Pa.	$2.10	$2.15
Easton, Md.	2.10	2.15
Milford, N. J.	1.00	1.10
Chestertown, Md.	2.10	2.15
Oxford, Pa.	1.80	1.90
Dover, Del.	1.95	2.05
Elkton, Del.	1.80	1.90
Millville, N. J.	1.80	1.90
Conowingo, Md.	1.95	2.05
Lansdowne, Pa.	1.60	1.70
Aberdeen, Md.	1.80	1.90
Tobyhanna, Pa.		1.35

Fluorspar

Rates from Natrona, Pa. have been requested by shippers of fluorspar, in packages or in bulk, carload, min. wt. 60,000 lb., to Johnstown, Pa., $1.65; New Kensington and Hays, Pa., $1.80; and South Duquesne, Pa., $1.65 per net ton. Present rates are 17, 17½ and 15½ cents per 100 lb., respectively. Rates proposed are comparable with rates in the same general territory. Docket No. 25,204.

Fluxing Stone

A shipper at Kittanning, Pa., has requested a rate on crude fluxing limestone, carloads, min. wt. 90 per cent of marked capacity of car, to Pittsburgh, Pa., of 90 cents per gross ton. The present rate is 12 cents per 100 lb., sixth class, and the proposal is in line with other rates in this territory. Docket No. 25,180.

Sulphur

A carrier is proposing to publish a rate on sulphur (brimstone), crude in bulk, carloads; also unground and unrefined, in bags, carload, min. wt. 60,000 lb., from Philadelphia, Pa., to Austin, Pa., of 19½ cents per 100 lb. Docket No. 24,747 Sup. No. 1.

Slag

A shipper in Easton, Pa. has asked for a rate of 90 cents per net ton on slag to Delabole, Pa., carload min. wt. 90 per cent of marked capacity of car. The present rate is $1.05 per net ton. The proposal is comparable with rates from Easton to Martin's Creek and Bangor, Pa. Docket No. 25,152.

A request has been filed for the establishment of a rate on roofing granules, slag, carload, min. wt. 50,000 lb., from Marietta, Pa. to Duluth, Minn., $7.10; and Minneapolis, and St. Paul, Minn., $6.90 per net ton. These rates are comparable with rates in effect from Easton, Nottingham, Pa., and other nearby producing points. Docket No. 25,161.

Slate

A rate of 7 cents per 100 lb. has been proposed on crushed or ground slate, carload, min. wt. 90 per cent of marked capacity of car, but not less than 80,000 lb., from Cardiff, Md., Delta and Slate Hill, Pa., and Whiteford, Md., to York, Pa. The present rate is 10 cents per 100 lb., with a minimum weight of 50,000 lb. The proposed rate is comparable with rates on like commodities for like distances. Docket No. 25,151.

Stone

The carrier proposed to cancel the rate of 21½ cents per 100 lb. on natural stone (other than bituminous asphalt rock, granite, jasper, marble or onyx); blocks, pieces or slabs, rough quarried or sawed, four sides or less; and curbing and flagging, carloads, from Shohola to Hawley, Pa., and from Mast Hope to Lanesboro, Pa., to Tarrytown and Ossining, N. Y., as there is a rate of 19 cents in effect. Docket No. 25,177.

CENTRAL FREIGHT ASSN.

Agricultural Limestone

Reductions in the rates from Sibley, Mich. on agricultural limestone, in bags or in bulk in boxcars, carloads, min. wt. 80,000 lb., except when marked capacity of car is less, in which case the marked capacity of car will apply, but not less than 60,000 lb. to points in Michigan shown below. Present and proposed rates per ton in docket No. 26,650 are:

To	Proposed	Present
Dundee, Mich.	$1.10	$1.27
Tecumseh, Mich.	1.20	1.25
Manchester, Mich.	1.30	1.35

Crushed Stone, Slag and Sand

A proposal to reduce the rate on crushed stone, slag and sand, other than blast, engine or moulding, carloads, min. wt. 90 per cent of marked capacity of car, except when car is loaded to full cubical or visible capacity, actual weight to apply, from 95 cents per net ton to 88 cents, from Chicago, Ill., to Michigan City, Ind. Docket No. 26,651.

Latest Portland-Cement Statistics

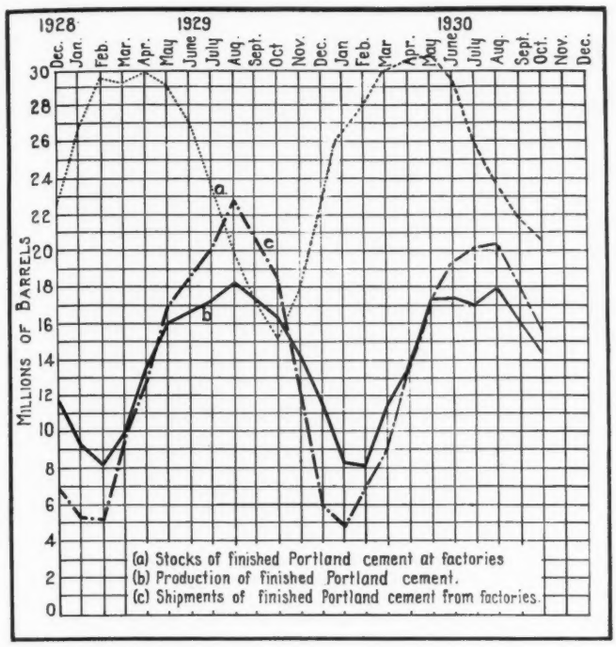

1928
1929
1930
Millions of Barrels
(a) Stocks of finished Portland cement at factories
(b) Production of finished Portland cement.
(c) Shipments of finished Portland cement from factories.

Chart showing production, shipments, and stocks on hand of finished Portland cement, by months—December, 1928, to October, 1930.

The Portland-cement industry in October, 1930, produced 14,410,000 bbl., shipped 15,599,000 bbl. from the mills, and had in stock at the end of the month 20,699,000 bbl. Production of Portland cement in October, 1930, showed a decrease of 13.9 per cent and shipments a decrease of 16.6 per cent, as compared with October, 1929. Portland-cement stocks at the mills were 34.6 per cent higher than a year ago.

The statistics here presented are compiled from reports for October, received by the Bureau of Mines from all manufacturing plants except two, for which estimates have been included in lieu of actual returns.

In the statement of the relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of October, 1930, and of October, 1929. In addition to the capacity of the new plants which began operating during the twelve months ended October 31, 1930, the estimates include increased capacity due to extensions and improvements at old plants during the period.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN SEPTEMBER, 1930

Exported to—	Barrels	Value
Canada	4,857	$17,168
Central America	2,659	14,006
Cuba	4,805	12,298
Other West Indies and Bermuda	1,995	2,391
Mexico	7,880	22,467
South America	18,175	62,316
Other Countries	3,223	19,738
Total	46,594	$153,384

DISTRIBUTION OF CEMENT

Shipped to—	August		September	
	1929	1930	1929	1930
Alabama	271,466	106,464	179,011	68,936
Alaska	2,105	4,465	282	1,362
Arizona	57,184	51,855	56,000	39,785
Arkansas	187,688	165,886	206,476	150,714
California	1,007,181	869,963	915,829	837,669
Colorado	105,397	106,576	91,602	82,050
Connecticut	241,126	205,553	206,737	195,962
Delaware	56,135	47,898	34,281	26,704
District of Columbia	125,732	126,581	107,654	137,507
Florida	100,975	85,673	88,730	76,333
Georgia	160,279	186,694	117,262	163,464
Hawaii	26.037	19,301	24,896	16,778
Idaho	26,051	52,084	27,375	46,308
Illinois	1,969,576	1,604,378	1,721,624	1,704,696
Indiana	990,059	686,122	909,295	497,163
Iowa	1,108,711	1,077,919	968,958	781,608
Kansas	338,052	271,491	332,819	250,548
Kentucky	205,597	265,288	176,115	241,402
Louisiana	172,697	235,564	171,673	163,544
Maine	79,258	128,866	94,201	148,381
Maryland	323,021	314,239	294,089	285,312
Massachusetts	365,297	328,187	356,318	331,061
Michigan	1,891,753	1,269,546	1,601,684	1,018,648
Minnesota	533,434	602,931	430,298	374,833
Mississippi	131,963	96,483	107,651	51,680
Missouri	896,327	770,346	748,870	710,759
Montana	89,417	36,407	77,505	44,217
Nebraska	270,919	226,618	224,168	241,572
Nevada	12,186	14,645	14,180	16,111
New Hampshire	116,275	81,651	75,573	84,449
New Jersey	958,357	709,844	825,204	610,200
New Mexico	29,932	36,680	21,621	28,870
New York	2,768,232	2,596,407	2,237,801	2,515,171
North Carolina	149,085	116,028	129,411	102,658
North Dakota	47,870	31,984	49,597	38,358
Ohio	1,364,665	1,286,700	1,207,197	1,103,327
Oklahoma	371,205	360,766	365,927	348,023
Oregon	124,852	114,400	122,669	112,133
Pennsylvania	1,710,648	1,912,983	1,632,356	1,557,564
Porto Rico	6,995	4,500	4,190	10,250
Rhode Island	101,278	83,057	81,919	100,664
South Carolina	89,733	236,649	64,446	245,776
South Dakota	55,114	72,829	83,173	86,654
Tennessee	441,869	285,916	328,182	294,910
Texas	877,463	605,660	697,091	573,392
Utah	57,547	44,554	73,952	39,116
Vermont	181,612	104,324	135,894	66,810
Virginia	205,771	179,227	161,521	174,179
Washington	310,711	341,647	305,056	328,595
West Virginia	209,590	216,018	164,543	196,307
Wisconsin	952,914	842,250	759,187	700,327
Wyoming	26,480	20,642	24,015	20,224
Unspecified	89,633	20,373	52,207	4,888
	22,993,454	20,263,112	19,888,315	18,047,952
Foreign countries	58,546	35,888	61,685	35,048
Total shipped from cement plants	23,052,000	20,299,000	19,950,000	18,083,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN SEPTEMBER, 1930

Imported from—	District into which imported	Barrels	Value
Belgium	Massachusetts	23,083	$27,283
Canada	Maine and New Hampshire	197	591
	Porto Rico	2,564	3,744
	Total	2,761	4,335
Denmark	New York	21,225	21,139
France	New York	862	1,559
Germany	Los Angeles	752	1,438
	San Francisco	127	327
	Total	879	$1,765
Japan	Hawaii	775	818
United Kingdom	New York	1,511	2,823
	Grand Total	51,096	$59,721

RELATION OF PRODUCTION TO CAPACITY

	October		September	August	July
	1929 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)
The month	77.0	65.4	75.7	81.0	77.8
The 12 months ended	67.3	64.2	65.2	65.6	66.1

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1929 AND 1930 *(In thousands of barrels)*

Month	Production		Shipments		Stocks at End of Month	
	1929	1930	1929	1930	1929	1930
January	9,881	8,498	5,707	4,955	26,797	27,081
February	8,522	8,162	5,448	7,012	29,870	28,249
March	9,969	11,225	10,113	8,826	29,724	30,648
April	13,750	13,521	13,325	13,340	30,151	30,867
May	16,151	17,249	16,706	17,224	29,624	30,891
June	16,803	17,239	18,949	18,781	27,505	29,364
July	17,315	17,078	20,319	20,153	24,525	26,289
August	18,585	17,821	23,052	20,299	20,056	23,824
September	17,223	16,124	19,950	18,083	17,325	21,889
October	16,731	14,410	18,695	15,599	15,381	20,699
November	14,053	.....	11,222	.....	18,213	.....
December	11,215	.....	5,951	.....	23,538	.....
Totals	170,198	.....	169,437	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, IN OCTOBER, 1929 AND 1930 *(In thousands of barrels)*

District	Production		Stocks at End of Month	
	1929	1930	1929	1930
Eastern Pa., N. J., and Md.	3,202	2,470	962	1,025
New York and Maine	1,045	1,183	441	430
Ohio, Western Pa., and W. Va.	1,578	1,525	478	648
Michigan	1,350	1,141	465	820
Wis., Ill., Ind. and Ky.	1,779	1,706	367	649
Va., Tenn., Ala., Ga., Fla. and La.	1,205	1,088	603	876
Eastern Mo., Ia., Minn. and S. Dak.	1,657	1,590	499	500
W. Mo., Nebr., Kan., Okla. and Ark.	1,281	992	208	301
Texas	793	522	293	328
Colo., Mont., Utah, Wyo. and Idaho	283	160	274	329
California	1,059	1,091	944	1,023
Oreg. and Wash.	283	427	400	402
Totals	15,515	13,895	5,934	7,331

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN OCTOBER, 1929 AND 1930, AND STOCKS IN SEPTEMBER, 1930 *(In thousands of barrels)*

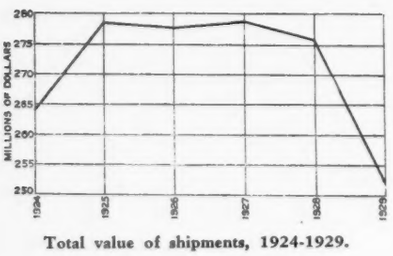
District	October						Stocks at End of September
	Production		Shipments		Stocks at End of Month		
	1929	1930	1929	1930	1929	1930	1930
Eastern Pa., N. J., and Md.	3,571	2,793	4,043	3,535	4,000	4,225	4,966
New York and Maine	1,129	1,220	1,407	1,201	996	1,088	1,069
Ohio, Western Pa., and W. Va.	1,731	1,655	2,176	1,704	2,240	3,030	3,079
Michigan	1,437	1,130	1,323	1,093	1,075	2,317	2,279
Wis., Ill., Ind. and Ky.	1,935	1,938	2,346	2,115	1,329	2,574	2,751
Va., Tenn., Ala., Ga., Fla. and La.	1,306	1,132	1,419	1,248	1,498	1,697	1,814
Eastern Mo., Ia., Minn. and S. Dak.	1,718	1,591	1,870	1,618	1,273	1,542	1,569
W. Mo., Nebr., Kan., Okla. and Ark.	1,331	957	1,508	947	621	1,652	1,643
Texas	777	484	743	469	527	721	707
Colo., Mont., Utah, Wyo. and Idaho	323	134	346	227	451	415	508
California	1,179	953	1,183	1,006	937	966	1,020
Oreg. and Wash.	294	423	331	436	434	472	484
Totals	16,731	14,410	18,695	15,599	15,381	20,699	21,889

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1929 AND 1930

Month	Exports				Imports			
	1929		1930		1929		1930	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	78,639	$ 283,002	82,387	$ 293,135	151,302	$ 177,976	201,609	$ 207,461
February	58,886	225,590	64,267	217,798	118,930	123,123	114,455	119,717
March	69,079	235,164	117,563	357,896	131,909	112,788	43,622	59,981
April	64,145	218,316	57,419	200,217	89,668	114,281	140,871	178,226
May	57,955	219,366	57,423	198,170	200,646	267,854	94,696	111,998
June	96,055	287,612	82,077	223,639	203,545	228,170	55,356	74,370
July	71,992	247,177	47,082	166,577	182,098	199,960	12,404	20,973
August	60,013	225,762	49,031	167,579	183,938	199,403	35,323	39,029
September	86,268	308,631	46,594	153,384	112,372	152,239	51,096	59,721
October	101,359	337,839	.....	.....	172,566	187,504	.....	.....
November	53,378	198,197	.....	.....	96,568	95,844	.....	.....
December	88,403	297,255	.....	.....	84,358	79,098	.....	.....
Totals	886,172	$3,083,911	.....	.....	1,727,900	$1,938,240	.....	.....

The Current Situation With Regard to Portland Cement

Plant capacity and shipments have increased rapidly in the cement industry since 1924, according to the United States Bureau of Mines, Department of Commerce. The increase in shipments became very slow about 1927, and from 1928 there was a decided decrease. While shipments are falling off, plant capacity is steadily increasing, and there is no indication of any recession in the growth of plant capacity, the Bureau points out.

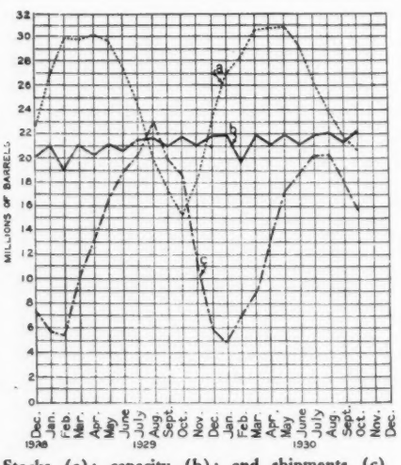


Total value of shipments, 1924-1929.

TOTAL FACTORY VALUE OF SHIPMENTS OF FINISHED PORTLAND CEMENT, 1924-1929

1924	$264,046,708
1925	278,524,108
1926	277,965,473
1927	278,854,647
1928	275,972,945
1929	252,153,789

Minor fluctuations occur in plant capacity from month to month, while stocks and shipments show marked seasonal fluctuations which are characteristic of the industry. Stocks of cement in 1930 were considerably higher than for the corresponding months in 1929. Shipments in 1930 show a moderate decrease from the 1929 figures. Shipments for the first



Stocks (a); capacity (b); and shipments (c) by months, Dec., 1928, to Oct., 1930.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1929 AND 1930 *(In thousands of barrels)*

Month	Production		Stocks at End of Month		Month	Production		Stocks at End of Month	
	1929	1930	1929	1930		1929	1930	1929	1930
January	12,012	10,504	9,642	9,646	July	15,214	15,067	11,619	11,684
February	11,255	10,008	12,436	11,572	August	15,829	15,244	8,995	9,275
March	12,450	13,045	14,948	13,503	September	15,165	14,577	7,009	7,783
April	14,166	15,025	15,479	15,164	October	15,515	13,895	5,934	7,331
May	15,444	16,607	14,911	14,668	November	14,087	.....	6,134	.....
June	15,312	15,895	13,587	13,452	December	12,539	.....	7,526	.....

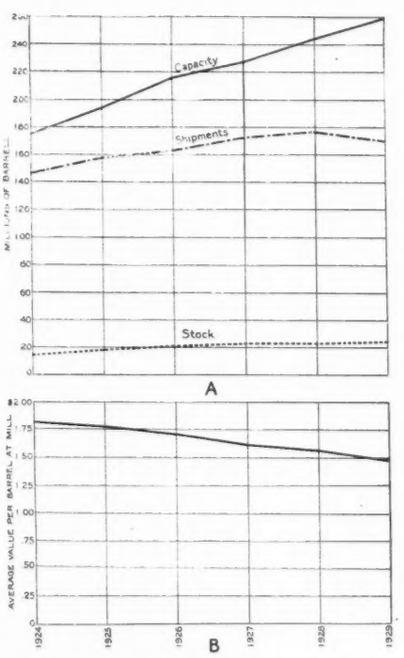
FINISHED PORTLAND-CEMENT CAPACITY, SHIPMENTS, STOCKS AT MILLS AT END OF YEAR, AND AVERAGE FACTORY VALUE PER BARREL, IN THE UNITED STATES, 1924-1929

Year	Annual Capacity (*Barrels*)	Shipments (*Barrels*)	Stocks at End of Year (*Barrels*)	Average Factory Value per Barrel
1924	175,100,000	146,047,549	14,151,695	$1.81
1925	193,558,000	157,295,212	18,336,173	1.77
1926	215,300,000	162,187,090	20,740,187	1.71
1927	227,080,000	171,864,728	22,457,382	1.62
1928	243,702,000	175,838,332	22,760,103	1.57
1929	259,344,000	169,868,322	23,537,817	1.48

10 months of 1929 total 152,264,000 bbl. and for 1930, 144,272,000 bbl.

The facts brought out most forcibly in the Bureau's survey of the situation are: (1) A rapidly increasing plant capacity with no indication of a falling off in the rate of increase; (2) a moderate falling off in shipments; (3) a moderate increase in stocks on hand; and (4) a pronounced and steady decrease in price per barrel. Future conditions that may develop as a result of this combination of circumstances demand the earnest consideration of every cement-plant operator.

The accompanying tables and graphs, compiled from reports of the producers of Portland cement, show comparative figures of finished Portland cement manufacturing capacity, mill shipments, and stocks for the years, 1924-1929, and by months, for the period, December, 1928, to October, 1930, and range in plant prices.



(A) Capacity, shipments and stocks at end of year; (B) Range in average value per barrel, 1924-1929.

MONTHLY ESTIMATES OF FINISHED PORTLAND-CEMENT SHIPMENTS, STOCKS, AND MANUFACTURING CAPACITY, DECEMBER, 1928, TO OCTOBER, 1930, IN BARRELS

Month	Shipments	Stocks at End of Month	Capacity
December, 1928	7,384,000	22,760,000	20,181,000
January, 1929	5,707,000	26,797,000	21,049,000
February	5,448,000	29,870,000	19,012,000
March	10,113,000	29,724,000	21,049,000
April	13,325,000	30,151,000	20,340,000
May	16,706,000	29,624,000	21,142,000
June	18,949,000	27,505,000	20,730,000
July	20,319,000	24,525,000	21,421,000
August	23,052,000	20,056,000	21,607,000
September	19,950,000	17,325,000	21,060,000
October	18,695,000	15,381,000	21,731,000
November	11,222,000	18,213,000	21,060,000
December	5,951,000	23,538,000	21,793,000
January, 1930	4,955,000	27,081,000	21,886,000
February	7,012,000	28,249,000	19,684,000
March	8,826,000	30,648,000	21,793,000
April	13,340,000	30,867,000	21,120,000
May	17,224,000	30,891,000	21,886,000
June	18,781,000	29,364,000	21,180,000
July	20,153,000	26,289,000	21,948,000
August	20,299,000	23,824,000	22,010,000
September	18,083,000	21,889,000	21,300,000
October	15,599,000	20,699,000	22,041,000

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These, interesting by comparison with practices in vogue today, are printed in this column each issue.*

▲ *Fourteen Years Ago* ▲

Sand-and-gravel operations were about to be established at Barry, Ill., by the Barry Sand & Gravel Co., composed of George E. Hoffman, John C. Brendt and Joseph Webb. Near Anchorage, La., J. W. Thompson had put into operation a new plant to screen and wash sand and gravel that was recovered by four dredges about twenty miles distant near Profit Island. The dredges were unloaded by a floating stiff-leg derrick furnished by the Lidgerwood Mfg. Co. and equipped with a 3-cu. yd. clamshell bucket made by the Andresen-Evans Co.

* * *

The France Stone Co. had plants in Ohio, Michigan and Indiana, with headquarters in Toledo, O. These included fifteen crushed-stone and five slag plants. Practically all of the stone was hard limestone that was sold as concrete aggregate, railroad ballast, and macadam. The company's newest plant at Monroe, Mich., with a daily capacity of 90 to 100 cars, employed Loomis well drills, two Marion steam shovels, Western and Kilbourn & Jacobs dump cars, Porter and Vulcan locomotives, a Gates No. 1 primary crusher, Allis-Chalmers revolving screens, Stephens-Adamson conveyors and four Gates secondary crushers.

▲▲ *Ten Years Ago* ▲▲

Officials of the Highway Industries Assn. and the U. S. Bureau of Public Roads were of the opinion that road building during 1921 would be extensive in every state, for the following reasons: renewed construction had not yet completed the projects that were abandoned during the War; money appropriated for road building had accumulated; materials were easy to obtain; labor would be cheap, probably. The 1921 expenditure was estimated at $550,000,000.

* * *

The winter operation of pits and

quarries, according to Daniel J. Hauer, must contend with two factors—bad weather and lack of business. This is true all over the country, especially in the North. Climatic conditions increase costs from five to thirty per cent. When a plant is not operating, invested capital is idle. If possible, operators should prepare, during the regular season, stocks that can be sold during the winter for fluxes or lime-burning operations. One advantage in year-around activity is the retention of a regular crew of workmen. If a market can be found for coarse stone, such as rip rap or flux stone, a quarry may be worked for these only during the winter season, letting the smaller stone remain on the quarry floor for the summer season's production.

* * *

E. J. Krause, vice-president of the National Crushed Stone Assn., was the leading figure in the Columbia Quarry Co., St. Louis, Mo., which operated five plants in neighboring counties of Illinois. The plant at Krause, Ill., was equipped with four gyratory crushers, three revolving screens, two ring-hammer pulverizers and three vibrating screens.

▲ ▲ *Five Years Ago* ▲ ▲

The attendance record was broken by the recent annual meeting, at the Drake Hotel, Chicago, of the Portland Cement Assn., registration showing 356 individuals who represented 75 companies. Election results: Blaine S. Smith, Universal-Portland Cement Co., president; Lowell R. Burch, Atlas Portland Cement Co., first vice-president; C. A. Irvin, Alpha Portland Cement Co., second vice-president, and John W. Boardman, Huron & Wyandotte Portland Cement Co., treasurer.

* * *

The economics of drilling operations in quarries was discussed by R. N. Van Winkle, who asserted that it does not cost a penny more to have holes properly drilled and correctly spaced, often drill-holes are too far apart, secondary blasting costs should never exceed 15 to 30 per cent of the primary blasting cost, and four to twenty tons of stone should be dislodged per foot of hole in bank shooting.

* * *

R. C. Towles, for two years director of the agricultural work of the National Lime Assn., had resigned to become agriculturist with the American Cyanamid Co., New York.

Florida Rock Producer Again Operating Plant

With more than fifty men employed, the plant of the Consolidated Rock Products Co., located near Brooksville, Fla., resumed operations last month. The plant had been idle since last June although sales have been quite active during past months, the company having a large stock on hand when it halted operations early this summer.

Cement and Crushed Stone Head List of California Non-Metallics

Compilation of the final returns from the mineral producers of California for 1929 by the statistical section of the State Division of Mines, under the direction of Walter W. Bradley, state mineralogist, shows the total value of the year to have been $432,248,228, being an increase of $99,533,995 over the 1928 total of $332,714,233. There were fifty-four different mineral substances, exclusive of a segregation of the various stones grouped under gems; and all but one of the fifty-eight counties of the state contributed to the list.

The following figures are published for the 1929 non-metallic mineral production of California:

Material	Quantity	Value
Barite	26,796 tons	$ 168,829
Cement	12,794,729 bbl.	21,038,565
Dolomite	58,644 tons	156,928
Feldspar	13,377 tons	78,404
Fullers' earth	15,541 tons	170,563
Gypsum	140,844 tons	396,951
Lime	42,834 tons	417,101
Limestone	162,315 tons	557,617
Magnesite	47,769 tons	488,014
Pumice, volcanic ash	10,449 tons	76,123
Salt	392,039 tons	2,665,436
Silica	18,686 tons	79,210
Soapstone, talc	18,676 tons	193,493
Soda	90,646 tons	1,838,657
Stone, crushed	.....	17,840,159

A classification "unapportioned" includes asbestos, diatomaceous earth, mica, potash, slate and tube-mill pebbles, with total value of $5,329,679.

The yield of barite came from single properties in Mariposa, Nevada and Santa Barbara Counties, and from two properties in San Bernardino County. The output was consumed in the manufacture of lithopone, as heavy-gravity oil-well-drilling mud, and in chemicals.

The cement production came from eleven operating plants in nine counties, employing a total of 2,220 men. Three plants in San Bernardino County made a total of 3,576,005 barrels valued at $4,603,361, the balance of the state's production coming from a single plant in each of the following counties: Calaveras, Contra Costa, Kern, Merced, Riverside, San Benito, San Mateo and Santa Cruz.

Single quarries in Inyo, Monterey and Tuolemne Counties furnished the total production of dolomite. It was shipped as steel-furnace flux, and for the manufacture of refractories and carbon-dioxide gas.

Feldspar was produced by five operators in Imperial, Riverside and San Diego Counties. The requirements of the pottery trade demand that, in general, the percentage of free silica associated with the feldspar be less than 20 per cent, and, in some cases, the potters specify less than 5 per cent. An important factor, also, is the iron-bearing minerals frequently present in pegmatites and granites, such as biotite (black mica), garnet, hornblende and black tourmaline. Feldspar for pottery uses should be practically free of these.

Only a small part of the 1929 production of magnesite was sold crude, practically all of it being shipped in its calcined form. The material came from San Benito, Santa Clara, Stanislaus and Tulare Counties with a single producer in each. From 2 to 2½ tons of crude material are mined to make one ton of calcined.

The production of pumice and volcanic ash came from two properties in Fresno County and a single property each in Kern, Imperial, Inyo, Mono, San Bernardino and San Luis Obispo Counties. The material from Imperial and Inyo and a portion from Mono is the vesicular, block variety and was sold for abrasive purposes. The balance of the Mono material and that from Fresno, Kern and San Luis Obispo was the volcanic ash, or tuff variety, and was employed in making soap, cleanser compounds, and a large tonnage is being utilized as a concrete filler in cement displacement. The Kern County ash is going into the preparation of one of the popular and nationally advertised brands of cleanser compounds.

The silica production originated in eight counties—Contra Costa, El Dorado, Imperial, Mariposa, Monterey, Placer, Riverside and San Diego. There are various deposits of quartz in California which could be utilized for glass making but, to date, they have not been so used, owing to the cost of grinding and the difficulty of preventing contamination by iron while grinding. The industry is of limited importance, so far, because of the fact that much of the available material is not of a grade which will produce first-class colorless glass; for such, it must be essentially iron-free. Even a fractional per cent iron imparts a green color to the glass.

More than three-fourths of the talc-soapstone production was high-grade talc from Inyo and San Bernardino Counties and was utilized mainly in toilet powders, paint, paper and rubber manufacture, and some in ceramics. The remainder came from Butte and El Dorado Counties, being soapstone, with some of the El Dorado material, a steatite variety, used in making electrical insulators. Inyo County has three producers, Butte and San Bernardino Counties, two producers each, El Dorado County a single producer. The soapstone grades were used mainly for roofing granules and as a filler in roofing paper, and part also in magnesite cement. Californian talc is competing successfully with imported talc in the toilet trade on the basis of quality.

Review of Foreign Practice

Making Sulphuric Acid from Gypsum Progresses

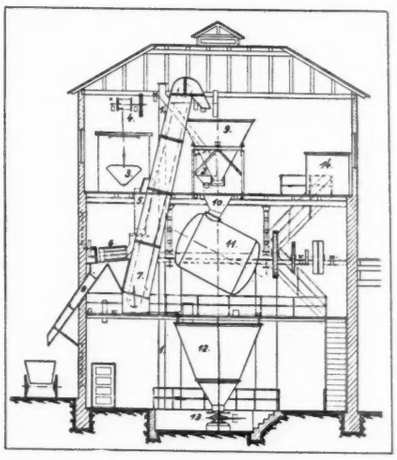
The commercial production of sulphuric acid from gypsum was perfected by the Germans in 1917, after several years of patient and costly investigations, and one can find in *Zeitschrift fuer Angewandte Chemie* of Feb. 11, 1926, the text of a lecture by Dr. Mueller on this new technique. At present the Germans, far from suspending the manufacture by this process which according to some points of view is unsatisfactory (whether on account of the amount of coal necessary to release the SO_2 or on account of the transportation of raw materials), are preparing to give it a new extension.

At Leverkusen, a single 60-meter kiln is in operation. Beside it, a second kiln of the same model is being rebuilt with a view to increasing capacity. The plant can furnish 50 tons of sulphuric acid and about the same of cement clinker, capable of yielding 150 tons of cement for the market. Only anhydrite is used as a raw material, rather than gypsum, so as to avoid useless transportation charges. The clinker, of very good appearance, which issues from the kiln, does not pass direct to the mill, but is mixed in suitable proportions with gypsum and with blast-furnace slag. This mixture, suitably mixed and ground, is sold under the name "Hochofenzement" or blast-furnace cement. At Leverkusen the production of sulphuric acid by the Bayer process represents only about a tenth of the total output of the plant. Part of it is used in the company's own works, and some is sold commercially.—*Revue des Materiaux de Construction* No. 251, p. 326, August, 1930.

Operation of a German Sand-Lime Brick Plant

Hamburg, Germany, is noted for its sand-lime-brick industry, and one of the most recent of the plants there, built by Johannes Thiessen, one of the pioneers and outstanding figures of the industry, is notable for its rational and labor-saving design. The sand for the process is excavated near the plant and hauled to the brick works in cars which are hoisted to the mixing floor of the plant building, where the sand is discharged to screens that can be changed for different sizings. The screened sand is elevated to a large feed bin above. Lime is ground on the ground floor of the building in a ball mill and elevated to a weighing hopper beside the sand bin. Measured quantities of the sand and lime are fed into a hydrating and mixing trommel mounted eccentrically with its axis inclined so that in its revolution the hydrating and mixing is rapid and thorough.

The prepared mass of sand and lime is discharged to a bin and is conveyed to the feeding hopper of three Thiessen rotary brick presses, each of



Thiessen sand-lime-brick plant: (1) Lime elevator, (2) lime-weighing hopper, (3) sand car, (4) hoist, (5) sand chute, (6) rotary screen, (7) sand elevator, (8) oversize spout, (9) sand bin, (10) trommel feed hopper, (11) hydrating and mixing trommel, (12) receiving bin, (13) feeder, (14) warm-water container.

which has a capacity of about 2,700 bricks per hour. The bricks are then hardened in three kettles of 20 meter length and 2.1 meter diameter, each kettle holding twenty cars of 1,000 sand-lime-bricks each. A single large boiler provides steam for the kettles and for the operating machinery.—B. Krieger in *Tonindustrie-Zeitung* 54: 1128-9, Aug. 28, 1930.

A Guide to Studies on Cement Made Last Year

Only those who have tried conscientiously to follow all of the literature concerning the production and the properties of cement published during the course of a year can properly appreciate the vast amount of it and the difficulty of really getting it all together. In the July 31 and September 4 issues of *Zement* (Berlin) Dr. C. R. Platzmann has written a comprehensive article on "Progress of Cement Research in 1929" which indicates the subjects covered by almost all of the articles on cement published during that year. This guide to the 1929 literature is in a way a supplement to Wecke's "Handbuch der Zementliteratur" (Handbook of Cement Literature) published in 1927 by the Zementverlag G. m. b. H. of Charlottenburg, Germany, and in fact is a continuation of the immense compilation represented in that book. Dr. Platzmann's article covers seven pages in the two issues, and is carefully arranged by subjects, being systematically treated in separate sections on scientific cement research; analytical and testing methods; properties of cement, influences on it, and questions of standardization; and operating problems and new cement works.—*Zement* 19:722-724 and 843-847, July 31 and Sept. 4, 1930.

Interaction of Alumina and Portland Cements

It has been observed repeatedly that Portland cement and alumina cement present together have a disturbing effect on the hardening of each cement. It has usually been maintained that the hardening process of neither cement has been sufficiently investigated to permit a determination of the chemical reactions that explain this effect; it has been assumed, however, that free calcium hydroxide from the Portland cement and free aluminum hydroxide formed during the hardening of the alumina cement react with each other and cause this disturbance. The authors conducted a series of investigations toward the clarification of this problem, by observing the reactions of Portland cement along with a series of fused calcium aluminates.

Fused aluminates high in alumina, standing near the composition of fused alumina cement, have an injurious effect on the strength of Portland cement with which they are mixed, even in quantities of 25 to 40 per cent and after the brief duration of one day. Fused aluminates containing more than 2.5 molecules of lime to 1 molecule of alumina show the tendency to increase the strength of Portland cement with which they are mixed; this tendency is obscured, however, more and more with advancing duration of time by the disturbance of the aluminates. Fused aluminates of moderate lime content of 2 to 2.5 molecules of lime to 1 molecule of alumina show a disturbance after a short time of the Portland cement with which they are mixed, only if they are mixed in quantities of 60 to 75 per cent; with longer observations even quantities of 25 per cent are sufficient to produce the maximum disturbance. The progression of the disturbing phenomena verify, in dependence on the quantity and composition of the fused aluminates as well as in dependence on the duration of the effect, the assumption that the disturbance is to be attributed to a reaction between the calcium hydroxide separated from the Portland cement during hardening, and the aluminum hydroxide separated from the alumina cement.—Prof. Dr. Hans Kuehl and Ing. Setsuo Ideta in *Zement* 19:792-795, Aug. 21, 1930.

Recent Patents

AMERICAN

Cement

Making Portland cement. Frederich W. Huber, Riverside, Cal. No. 1,781,232.

Crushing

Gyratory crusher. Richard Bernhard, Allentown, Pa., assignor to Traylor Engineering & Manufacturing Co., same pace. No. 1,780,459.

Apparatus for disintegrating ore and other material (rotatable mill). Harlowe Hardinge, York, Pa., assignor to Hardinge Co., same place. No. 1,780,915.

Drying

Sand-drying apparatus. Roston Tuck, Needles, Cal. No. 1,781,484.

Excavating

Rope-thrusting shovel with differential thrust. Mitchell L. Fykse, South Milwaukee, Wis. No. 1,780,351.

Dipper-tooth. Walter S. McKee and Eugene C. Bauer, Chicago, Ill., assignors to Kensington Steel Co., same place. No. 1,780,397.

Material Handling

Truck for transporting cementitious materials. Ota T. & Oakley J. Graham, Richmond, Va. No. 1,780,973.

Skip-bucket discharge mechanism. Robert H. Beaumont, Radnor, Pa., assignor to R. H. Beaumont Co., Philadelphia, Pa. No. 1,781,211.

Material-handling apparatus. Loomis J. Kelly, Salem, Va. No. 1,781,644.

Miscellaneous

Concrete road construction. John N. Heltzel, Warren, O. No. 1,780,588.

Process of and apparatus for slaking lime. William H. Henderson, Youngstown, O. No. 1,780,821.

Mixing

Control mechanism for concrete mixers. Erich H. Lichtenberg, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,780,932.

Concrete mixer. Vaino Piispanen, Helsinki, Finland, assignor to Koehring Co., Milwaukee, Wis. No. 1,780,940.

Screening

Apparatus for screening materials. Morley P. Reynolds, Cleveland Heights, O., assignor to W. S. Tyler Co., Cleveland, O. No. 1,781,526.

FOREIGN

Blasting

Blasting cartridge. Safety Mining Co. (Arthur W. Helmholtz and Dent Ferrell). Canadian 305,217.

Progressive heating cartridge. Safety Mining Co. (Dent Ferrell). Canadian 305,218.

Cement

Waterproof cement. E. L. George (S. A. I. G., Soc. Anon. Invenzioni Guadagnin). British 336,860.

Form press particularly for the production of briquettes of cement raw mix. Rudolf Thiele. German 510,558.

Crushing and Grinding

Grinding, crushing and mixing mills. J. Wass. British 336,212.

Method and means for reducing friable materials. G. C. E. Keet. British 336,687.

Process and apparatus for crushing and grinding solids. M. P. Appleby, F. Postlethwaite and Imperial Chemical Industries Ltd. British 336,730.

Pulverizing machine. P. F. Hirsch. British 336,776.

Pulverizing mills. Babcock & Wilcox Ltd. (Fuller Lehigh Co.). British 336,787.

Three-compartment mill. Torrance & Sons Ltd. French 694,763.

Grinding mill. Maschinenbau Anstalt Humboldt. French 694,903.

Unit pulverizer. Austin A. Holbeck. Canadian 305,340.

Hammermill, particularly for the reduction of stone. Maschinenbau Anstalt Humboldt. German 510,970.

Grinding mill. Chauffe et Combustion Soc. Anon. German 510,525.

Roll crusher. Alfred E. G. MacCallum. German 510,526.

Sifter for impact pulverizer. Paul Anger. German 510,849.

Windswept impact pulverizer. Paul Anger. German 510,850.

Sifter for impact pulverizer. Paul Anger. German 510,851.

Drilling

Portable drills and similar tools. C. H. Vidal. British 336,478.

Portable power-driven tools for performing drilling or similar operations. R. A. L. Volet. British 336,900.

Rock drills. R. A. Bedford. French 694,825.

Automatic advancing device for hammer drills. M. Maillard. French 694,547.

Rock drill. Joseph Auger. Canadian 305,292.

Rock drill. Francois Jacques Barthelemy Berry and Paul Guerre. German 510,321.

Dryers

Drying apparatus. E. A. Alliott and Manlove, Alliott & Co. Ltd. British 336,357.

Drying of material. L. N. Lloyd and Phillips Engineering Co. Ltd. British 336,602.

Rotary drying apparatus. J. B. Vernay. British 336,874.

Drying apparatus. C. B. Cooke. British 336,679.

Excavating

Mechanical loading shovels. S. R. C. Smith. British 336,316.

Means for the hauling of excavating and other machinery. R. J. Dann. British 318,100.

Floating dredgers. Krupp Grusonwerk Akt.-Ges. and Progres Minier et Metallurgique Soc. Anon. British 336,873.

Excavator bail bracket. American Manganese Steel Co. Canadian 305,120.

Excavator tooth point. American Manganese Steel Co. Canadian 305,121.

Firing

Apparatus for feeding pulverized fuel. H. D. Tollemache. British 336,673.

Burner for pulverized fuel. Buell Combustion Co. Ltd. Canadian 305,414.

Gypsum

Process for production of gypsum mortars. Louis Emile Chassevent German 510,699.

Kilns

Flexibly, attached guides for rotary kilns, dryers, etc. Fellner & Ziegler Akt.-Ges. German 510,396.

Sealing rings for rotary kilns and the like. Huron Industries, Inc. and B. E. Green. British 336,729.

Improvements in kilns and particularly for calcination of gypsum. Etablissements Poliet & Chausson. French 695,029.

Process and apparatus for feeding a rotary cement kiln. P. Bezard. French 695,153.

Material-Handling

Jigging conveyors. Preparation Industrielle des Combustibles (Soc. Anon.) British 310,889.

Non-detaching interchangeable coupling for jigger conveyors. J. J. Hughes and D. Griffiths. British 336,455.

Feeding devices for granular and like materials. H. G. Lykken. British 336,581.

Driving gear of jigging conveyors. T. B. Wilkinson. British 336,641.

Devices for controlling and feeding materials. W. Ross. British 336,680.

Pneumatic conveyors. K. Baumgartner and F. Patzold. British 319,009.

Conveying apparatus. T. M. Campbell. British 336,820.

Elevators, hoists or the like. C. H. Fowler and G. Hobson. British 336,903.

Screening and Separating

Separation of dust from air and gases. G. Row. British 336,221.

Means of extracting dust and grit from air, flue gas or other medium. Pneumatic Conveyance & Extraction (1979) Ltd. and W. A. Smith. British 336,620.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Legal Information for Operators

Kentucky Rock Company Denied Recovery Claim

It is well settled that a material man is not entitled to recover payment from a bonding company for materials furnished to a contractor, unless the contract or bond clearly states that the bond is given for the benefit of the material man.

For instance, in Kentucky Rock Co. v. Fidelity & Casualty Co., 37 F. (2d) 279, a higher United States Court held that a material man had no right of action against a surety on a bond which indemnifies a city against a breach of contract, since the bond and contract were intended to protect the owner only.

The facts of this case are that a contractor, who had entered into a construction contract with a city, furnished a bond containing the following clause:

"The bonding company shall keep and save the obligee (city) harmless and indemnify it from and against any and all claims of every description incurred or growing out of the prosecution or construction of said work according to the terms of said contract. . . ."

The Kentucky Asphalt Co. furnished to the contractor a considerable quantity of asphalt for use in carrying out the contract. The contractor failed to pay for the material and the asphalt company filed suit to collect the amount from the bonding company. The Court held the latter not liable, and said:

"The meaning of the contract is plain and in such case the surety, even though it be a bonding company for profit, is entitled to have it interpreted according to ordinary principles. . . . The bond and contract, read together, were for the protection of the obligee, the city . . . Plaintiff (company) was neither a party to the bond and contract nor mentioned therein. The case is controlled, therefore, by the common-law rule that no one can maintain an action in his own name upon a contract to which he is not a party."

Innocent Purchaser Is Not Liable for Liens

An unusual point of the law, involving mechanic's lien, was decided in the recent case of Hortman-Salem Co. v. High-Grade Realty Co., 126 So. 566. In this case a company sold crushed rock to a person who was constructing a building. The seller presented an incorrect bill for $2,125 instead of $2,469, the value of the material used. Soon afterward the owner sold the building and the seller discovered that he had rendered an incorrect bill to the original owner. When the latter failed to make the additional payment the seller attempted to file a mechanic's lien on the building.

It is interesting to observe that the higher court held the lien on the building void, saying:

"The plea of estoppel, in my opinion, is good because the carelessness or the negligence of the plaintiff (the seller) caused the failure to have this $521 included in the purchase price. . . . But there is another maxim of law, which in my opinion, carries the case and that is the maxim that where of two innocent parties, one must suffer a loss, he through whose fault the loss occurred must bear it."

Strict Interpretation of Mechanic's Lien Law

All courts have adopted the rule to strictly construe state laws regulating enforced payments to contractors and material men by mechanic's lien. Such was held to be the law in the recently decided case of Central Co. v. Douglas, 127 So. 43.

In this case it was shown that the Louisiana law provides that where improvements are made by a property owner and building material is furnished to him by a material man, the latter is entitled to a mechanic's lien.

A property owner contracted with a contractor to construct a building. The contractor purchased building material and when the latter refused to pay for the same the material man sued to perfect a mechanic's lien. With reference to the above law, the court said:

"We do not think it is possible to say there was any conventional obligation on the part of Douglas (owner) to pay for the material furnished by plaintiff (material man) to Whittington (contractor). . . . It being conceded that the statute by which the owner of the property is held liable for the debts of the contractor and his property subjected to a privilege to pay the indebtedness must be strictly construed."

Municipality Relieved of Liability on Bond

It is well established that a municipality is relieved from liability for default of a contractor who agrees to perform public construction work, providing the contractor furnishes a reliable surety. Also, it is important to know that the subcontractors and material men may forfeit valuable rights to payment for labor and materials if their claims are not filed within the time specified by the law.

For illustration, in Citizens v. Sheboygan, 224 N. W. 720, it was disclosed that a contractor furnished a surety who guaranteed performance of a public construction contract. Certificates issued by the municipality to the contractor were cashed by the latter at a bank. Later the contractor was adjudicated a bankrupt. In the subsequent litigation the surety company argued that the delivery of the certificates to the bank constituted the latter a preferred creditor under the Bankruptcy Act, whereas the contractor contended that his mechanic's liens should be paid before payment was made to other creditors.

It is interesting to observe that the Court held the bank a preferred creditor and the subcontractors and material men were not entitled to liens since the latter did not commence the suit within three months after serving notice. This Court said:

"It thus becomes clear that, as the certificates were issued to the contractor and delivered to the bank, these certificates constituted payments. That is so because the statute authorizes it, the contract provides for it, and the certificates were actually delivered and accepted. . . . The bank having received these certificates in good faith at a time when there was no default on the part of the contractor, it must follow that the rights of the bank are superior."

Cement Specifications Are Upheld in Law Suit

It is well settled that no person may win a suit based on an ambiguous or contradictory contract. On the other hand, recovery may be had, and the contract is valid and enforceable, if the true intentions of the parties may be interpreted by the Court.

For instance, in the leading case of Rice v. Hanrahan Co., 285 Pac. 414, it was disclosed that the specifications for concrete work specified one part of Portland cement, two parts of sand, and four parts of broken rock or stone by measure. The specifications also provided that the cement used must be Portland cement which meets the requirements of the Standard specifications adopted by the American Society of Testing Materials.

It was contended that this contract was void. However, in holding it to be valid, the Court said:

"It thus appears that the contractor is required to furnish materials definitely described and to mix them ordinarily in the fixed proportions. . . . If the engineer may satisfy himself by tests 'made by some reliable chemist,' and those tests are 'to conform to specifications required' by the American Society of Testing Materials, it is fair to conclude that 'reliable chemists' in general, as well as engineers and contractors, are thoroughly familiar with the specifications intended."

Insurance Problems Discussed

The Trend in Workmen's Compensation Insurance

The immediate practical question of rate, accident prevention and choice of insurance company are so important in keeping down the overhead expense of business that we seldom think beyond them. Yet there are definite underlying tendencies developing today which are going to modify not only the cost and benefits of workmen's compensation insurance but even the relationships between employers, employees and the state government.

The American business man gets a bit of a shock when he reads that all workmen's compensation insurance came originally from Germany, starting even before Bismarck and the first emperor. The fact that "compensation" came to us by way of England has led to its being modified by the English laws, which is similar to ours. But if you want to see where we may be heading in this line you need only to note that in Germany, the state of origin, and many other countries, what started out as a simple indemnity for industrial accidents has now grown to be a full program of social insurance, covering accident, sickness, unemployment and old age pensions.

Backed by Labor

The impetus behind workmen's compensation insurance has come largely from the employees and naturally has been directed by the labor federations. True enough, it has not been entirely a one-sided bargain. Employers have made a substantial gain in getting rid of the expense and uncertainty of law suits for big damages. A producer now budgets the cost of industrial accidents through the medium of his insurance premium and in the long run he can usually pass this on to his customers by adjusting the selling price.

It is difficult to realize the plight of an injured worker in the old days. His only chance to collect indemnity was to sue for damages under the common law. This process was expensive and uncertain and carried with it the likelihood that the employer would discharge any worker who sued him. Furthermore, the law gave the employer a fairly easy defense in court. If the injured employee were guilty of contributory negligence he could collect nothing, regardless of how serious his loss might be. Even if another employee caused the accident, the common law stepped in with its old rules about "fellow servants" and prevented any recovery of damages. Workmen's compensation was a distinctly novel legal principle since it made the employer "liable without fault," the mere fact of employment establishing his responsibility.

Most States Have It

The principle of workmen's compensation insurance is generally admitted throughout the United States. Practically all states have it, although the exact form varies considerably. It is also universally admitted that workmen's compensation has a "public interest," and therefore the state legislatures have a right to regulate it. Some states regulate the insurance companies closely, some have very few restrictions, while a few actually issue the insurance themselves, through state funds. In fact, the variation in state regulation is so extreme that it is sometimes a task to keep track of the general principles.

The most effective function of the states has been in connection with chain service. It is both expensive and cumbersome to go into court concerning every little accident, and yet, if the insurers were allowed to settle losses without supervision, some might take advantage of ignorant employees. Most states have a commission which operates in a business-like way without much "red tape" to see that all claims are paid exactly according to the law.

Rates Move Down

The trend of government regulation of rates has been steadily downward. There is no profit in workmen's compensation insurance. This point is theoretically unimportant to the mutuals and reciprocals, because they are supposed to issue their policies "at cost." But, strange as it may seem, all the "gravy" has been squeezed out of the stock insurance company rates, so that no insurance company really wants to write this line and will do so only as an accommodation in the hope of getting automobile, public liability, burglary or some other more profitable account. In spite of steadily declining rates, the benefits under "compensation" get steadily bigger. Almost every session of every state legislature gives the injured laborers some broader or larger allowance at the expense of the employers. In spite of the efficient lobbying of manufacturers' associations, labor unions control more votes and legislators usually favor the union point-of-view. Furthermore, with our rising standard of living, the cost of medical and surgical service goes steadily upward and constantly increases the insurance load.

State Insurance Funds

A few states have actually gone into the insurance business. Most of these operate on a voluntary rather than a compulsory basis and permit every employer to choose between the state fund and the insurance companies. State funds are likely to grow in favor, since insurance is naturally a business comparable to the public utilities, but the rate of this growth will not be very fast. What would normally be the greatest argument in favor of insuring in a state fund—low cost—has been largely weakened by the steady reduction in rates mentioned above. The most definite feature about state funds is that their claim adjusters are usually more liberal with injured workmen and thus they tend to increase the cost. In the few states where the state fund is a monopoly and private companies are forbidden to operate, there is a saving of the duplication of personnel which is inevitable with competing companies. But a monopolistic state fund is a step toward socialism which independent business men will regard with suspicion because of its possible effect on legislation for other industries.

Insurance practically at cost, with steadily increasing payments to injured employes and greater regulation by the state, seems to be the definite future for workmen's compensation insurance.

Moves Headquarters to Cleveland from Chicago

Portland Concrete Machines Co., formerly of Chicago, has moved its headquarters to 4519 Hamilton Avenue, N. E., Cleveland, O. Clarence B. Dutton is president. The company sponsors a complete line of machinery for ready-mixed concrete plants, including elevators, bins, batchers, stationary mixers, truck mixers, and all other incidental equipment; as well as automatic machinery for producing block, tile and other concrete products. An engineering and consulting service whereby complete ready-mix and products plants are designed and equipped, and operating schedules and budgets prepared, is also conducted.

Ohio River Sand Firms Buy Fifteen New Barges

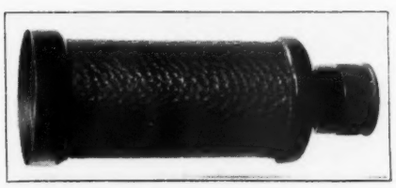
Fifteen barges were recently purchased by a number of aggregates producers operating along the Ohio River and will shortly be pressed into service on the river for transporting sand and gravel.

The Pittsburgh Gravel Co. of Baden, O., was the largest buyer, acquiring ten steel barges, and the McClain Sand Co. of New Martinsville, W. Va., a fleet of four. These vessels, which were formerly in coal-carrying service along the Monogahela River, are each 110 ft. long, 26 ft. wide and 8 ft. deep. Each has a carrying capacity of 400 tons. The Dravo Contracting Co. of Pittsburgh, Pa., has sold to the Suiter Material & Transportation Co. of Manchester, O., a standard steel sand-and-gravel barge of the 100-ft. type.

New Machinery and Supplies

New Optical Pyrometer Reads Kiln Temperature

A new optical pyrometer has been recently introduced and favorably received in the cement industry. This instrument, called the K & S pyrometer is of especial interest and value to cement plant operators, because of its simplicity of operation. Any burner can use this instrument for controlling the hot-zone temperatures at necessary intervals. To obtain the correct kiln temperature one need only look through the pyrometer into the kiln and read the temperature indicated by a needle on the scale in the line of vision inside the instrument; thus the hot-zone temperature of the kiln can



The pocket pyrometer.

be taken while looking directly at the point desired. The time required for a reading is about 30 seconds.

The principle of operation is that the heat rays issuing from the opening at the firing end of the kiln strike the lens in the front of the instrument and are concentrated on a bi-metallic spiral which expands to move a needle which in turn registers the temperature on a dial, visible while looking through the instrument into the fire.

The accuracy of the pyrometer, when checked with calibrated electrical instruments, is within 10 to 20 deg. F. It weighs 6 ounces, is 6 in. long by 2 in. in diameter and is ruggedly constructed.

The instrument should fill a long-felt want of the cement-plant superintendent who has been looking for a pyrometer which is practical for burning-floor control of hot-zone temperatures. Actual tests over a period of time have shown considerable saving of coal and an increase in the strength of the cement produced, due to uniform heating of the kiln.

The device is being marketed by Dr. R. E. Windecker, 862 Union Trust Bldg., Cleveland.

Develops New Series of Tenacious Gear Greases

A new series of gear lubricants for all types of heavy, slow-moving, open gears was developed after extensive tests by the research staff of E. F. Houghton & Co., Philadelphia. These are known as Tenac Nos. 1, 2, 3 and 4.

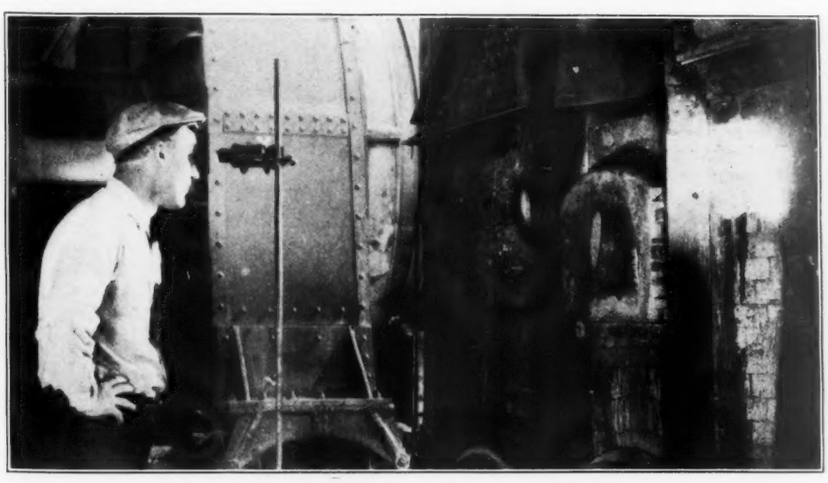
Ordinary greases or gear oils are not altogether satisfactory for gear lubrication because they do not entirely overcome metal-to-metal contact, and are readily thrown off when gears are in motion. This causes high frictional losses, and is responsible for undue power losses and premature wear of gears.

To overcome this condition better than it has ever been done before, the Houghton research staff has developed a lubricant which will not be thrown off the gears while they are in motion. After exhaustive tests, the company states that "Tenac has been tried in practically every type of gear installation and under most adverse conditions. In every case it has met all requirements very successfully."

There are different grades of Tenac. Tenac No. 1 is the heaviest of the series, while Tenac No. 4 is the lightest grade.

One of the outstanding points of advantage in the Tenac series is its extremely low cold test. Tenac No. 3 and No. 4, for example, can operate satisfactorily at 20 to 25 deg. lower temperature than most gear lubricants now on the market. The advantages of this point are especially important when low atmospheric temperatures are encountered.

No special device or method of application is required with the use of the Tenac series of gear lubricants. They are applied to the gears in the same manner as other lubricants used for the same purpose.



Operator using pyrometer to determine kiln temperature.

Variable-Speed Device Is of All-Metal Design

What is said to be the first all-metal variable-speed transmission on the market has recently been announced by the Link-Belt Co., Philadelphia. It is called the P. I. V. gear, the initials standing for "positive infinitely variable," indicating its characteristics.

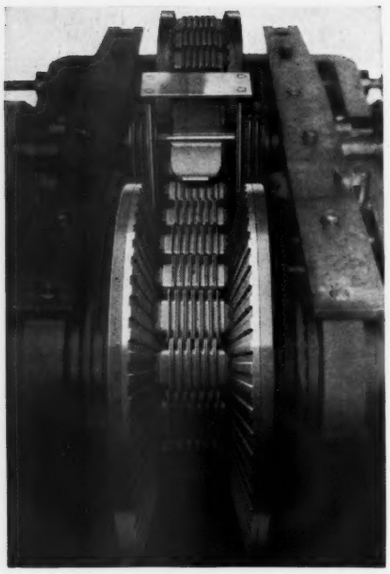
Basically, this new speed-change unit consists of two pairs of wheels of the opposed-conical-disk type, between which a unique chain transmits power.

Fully-enclosed case of variable-speed transmission.

The effective diameters of each pair of wheels can be altered under load to change the speed ratio, without steps and without dependence upon friction. On changing speed, the self-pitching chain rises in one set of wheels and descends in the other, so that while the input shaft connected to a motor or other source of power turns at constant speed, the output shaft is brought to the desired r.p.m.

Variable-speed devices employing adjustable conical discs and belts with side friction contacts have been used for some time. The wholly original feature of the P. I. V. gear is its use of a positive chain drive to transmit the power. Radial teeth are cut in the conical faces of the driving discs, and the self-adjustable teeth projecting beyond the sides of the chain are arranged to positively engage the radial teeth of the discs.

The chain used in the P. I. V. gear is made up of a series of steel leaves or links with joints consisting of hardened steel pins turning in segmental bushings. There are no teeth on the inner surface of this chain. Instead, what may be called teeth are made up of packs of hardened steel laminations or slats which extend through slots in



Tooth formation of new chain on minimum diameter of wheel.

the links at right angles to them, and project about ⅛ in. at each side of the chain. The individual containers which hold the packs of slats are secured in the openings of the links, but, within each such container, the slats are free to slide from side to side individually with relation to each other and adjust themselves to engagement with the radial teeth of the disks, over substantially the full range of diameters. The angle of the slat ends, 30 deg., is the same as that of the conical faces of the wheels.

New Vibrating Screens Take Large-Sized Rock

The Robins Conveying Belt Co. has placed a new vibrating screen on the market, known as the Mogul Gyrex, designed particularly for coarse scalping.

The screen is the result of much study by Robins engineers. Not only will it screen out material as large as six inches, but it will handle, in the feed, pieces ranging up to 20 in. in size. This makes it particularly suited for use in crushed-stone plants.

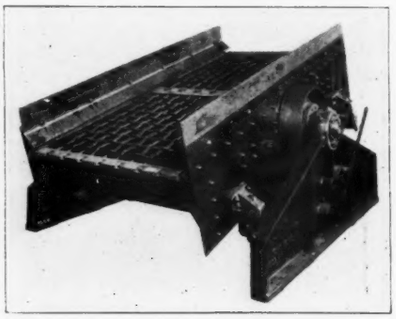
The Mogul is relatively a slow-speed unit. Compared with the faster 625- and 1,000-r.p.m. Gyrex units, its speed is only 475 r.p.m., but this speed combined with a ¾-in. stroke will keep any load stirred up. There is plenty of kick to the action. The heaviest, most jagged piece will not clog the mesh.

The high-carbon steel shaft is housed in a heavy, machined, cast-steel tube from one fly-wheel to the other. The screen live frame is rigidly attached to the tube, and the tube ends rest on the eccentric bearings which are in each flywheel. This arrangement makes the shaft full-floating thereby relieving it of the strain of supporting the heavy live frame. The tube itself is protected from wear by a rubber covering. In addition to relieving the shaft of bending stress, the tubular housing fully protects the shaft from the wear of material passing through the screen.

Bearings are of the self-aligning roller type to accommodate any shaft condition. They are inherently self-aligning and the possibility of "frozen" ball-and-socket housings is thus done away with. The eccentric bearings are mounted in the ends of the tubular shaft housing. The method of effectively preventing the escape of grease or the entrance of dirt is a most advanced yet simple feature. It consists of piston rings, two on each side of each bearing, which make a perfect labyrinth seal, permit the use of minute clearances, and eliminate rubbing action.

For ordinary installations, a 7½-hp. motor is sufficient, but where work is to be carried on during severely cold weather, a 10-hp. motor is recommended. A flat belt, "V" belt or direct-coupled drive may be used.

Three Mogul models are available: 48-102, which has a screen surface 4 ft. wide by 8½ ft. long; 48-120, which is 4 ft. wide and 10 ft. long, and 60-120, which is 5 ft. wide and 10 ft. long.



Vibrating screen designed for coarse scalping.

Each may be had in single, double or triple deck sizes.

The amount of material which may be handled by one unit is entirely dependent on the material, the size of openings and the degree of screening efficiency required. On large openings or where the bulk of the feed is oversize, as much as five or six hundred tons per hour may be handled.

Makes Conditioner for Mixing with Fertilizers

Part of the cost in producing mixed fertilizers is for the base material which is added to the active chemicals and plant foods. With the increasing adoption of the more concentrated grades of fertilizers, considerable difficulty has been encountered in finding substances which will maintain the mixtures from deterioration or becoming compact during storage and transportation.

The Sand Products Corp., 1056 West Canal St., Milwaukee, Wis., excavates its own raw materials and prepares a product which is marketed as SPC (special fertilizer conditioner), for blending with such chemicals as treble superphosphate, urea, potash, and ammoniated phosphate. It is said to contain sufficient fines to coat every particle of the chemicals so that the fertilizer will retain the qualities that are necessary for its successful application to the soil by mechanical means. With this filler or conditioner, the mixed fertilizer will remain mealy indefinitely, according to the claims made by the manufacturer.

New Hammer-mill Uses 2-Stage Reduction Plan

For over fifty years, Stedman's Foundry & Machine Works, Aurora, Ind., has been building crushing, grinding and pulverizing machinery. Stedman equipment is to be found in many plants throughout the United States and in almost every country in the world.

Over a year ago, the company entered the swing-hammer mill field with a complete line of swing- and ring-hammer crushers, grinders, pulverizers and shredders. A. E. Schneider, well known in the hammer-mill field, is in charge of designing and sales. For a number of years he was connected with the Williams Patent Crusher & Pulverizer Co. of St. Louis.

The line consists of three types and twenty-five sizes of mills—the smallest machine requiring 5 hp., the largest, 250 hp. The type A mill, a general purpose machine, is manufactured in nine sizes. It is especially designed for fine and semi-fine grinding and pulverizing. Up to date, this mill has successfully handled more than a hundred different materials.

All materials are reduced by the 2-stage reduction method. In this method of grinding, the shattering is done in suspension. The finish grinding or sizing is accomplished after

Hammer-mill for fine grinding.

gravity has been overcome. This secondary reduction step takes place between the face of an adjustable grinding plate and the hammer tips. This feature makes possible larger capacities, a more uniformly finished product and reduces maintenance cost.

Besides the 2-stage reduction method of grinding, Stedman mills have these special features: Built-in metal trap, exceptionally heavy renewable wearing plates, adjustable grinding plate, self-aligning anti-friction

bearings, extreme sectional construction (which allows for instant accessibility), and a heavy, rigid construction in the machine proper.

The type B machines are used for preliminary or secondary crushing. This mill is made in sixteen sizes—ranging from 15 hp. to 250 hp. The larger sizes will handle 18-in. to 24-in. cubes of limestone, gypsum, asphalt, rock or shale—reducing to ¾-in. and under in one operation.

High Shovel Built for Mounting on Tractors

The new Trackson high shovel for the model 20 McCormick-Deering tractor is now in production, after completing the most thorough and searching tests, both in the laboratory and in the field.

Mounted on the McCormick-Deering tractor, either with Trackson crawlers or with wheels, it digs, moves, and loads materials at lightning speed in one continuous operation and with only one man. Although it has a high-dumping clearance for loading big trucks, the new machine also has all the advantages of a low-lift shovel for digging, a feature in which it is decidedly ahead of other equipment of its kind.

The shovel does not interfere in any way with the use of the tractor for drawbar work. When the day's program includes hauling trailers, dump wagons, etc., pulling big scrapers, graders, or other machines, or snatching a big truck from the mud, the shovel may merely be locked in a partly raised position and the tractor moves right along, as easily as it would without the shovel mounting. In ease and simplicity of operation it is practically foolproof. The bucket is controlled by a single lever and an automatic clutch release eliminates the possibility of raising the bucket too high.

One of the outstanding improvements on the shovel is the fact that the bucket is held close to the tractor when it is in the digging position as well as when raised to its maximum height. The result is better balance and greater effectiveness for digging.

The front-end drive gives the operator complete control of the bucket, whether the tractor is in operation or standing still, with the clutch disengaged. This is a big advantage, especially for digging in hard materials, since it effects independent crowding action.

Several new features have been incorporated in the hoisting assembly of the new shovel, such as a twin-disk clutch of a type which was especially recommended by the manufacturers for this job, and a special worm gear running on extra-heavy ball and roller bearings which reduces the operating speed of the hoisting drums.

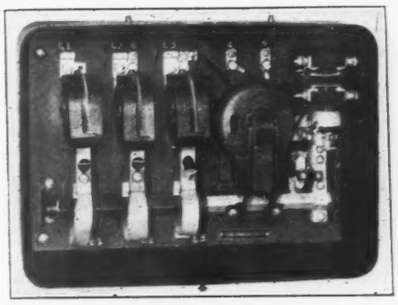
The high shovel loading a truck.

New Switch Contactors Held Closed by Latch

The General Electric Company announces the CR-2811 magnetic switch for use on either alternating- or direct-current circuits. This switch is provided with a latch which holds the contactor closed. Such a condition is particularly desirable (1) where the hum of a standard magnetic switch must be eliminated; (2) where the power consumed to hold the contactor closed by the usual method must be eliminated because of cost, and (3) where the switch must not open in case of coil failure, power failure or short circuit.

The device consists of a two- or three-pole, a-c. contactor with a latching mechanism, mounted on a base and with or without an enclosing case. The contactor is standard except for an extension of the shaft to which the latching mechanism is attached.

In operation, momentarily energizing the main contactor coil closes the contactor which is then latched closed. Momentarily energizing the trip coil trips the latch and opens the contactor. Either a single-pole, double-throw knife switch or a two-button, normally - open, momentary - contact type of push button may be used for this purpose. When the closing circuit is made, the contactor closes and an interlock immediately opens the control circuit, the contactor being held in by the latch. When the trip circuit is energized the closing coil is re-energized, releasing all pressure from the latch before the trip coil is called upon to raise the latch lever. This eliminates excessive wear on the latch and permits the use of a smaller tripping coil.



Magnetic switch with cover removed.

The switch is positive in its action. It is impossible to latch the contactor except in the fully closed position. The construction of the latch and the spring pressure applied to it provide against a release on account of vibration. The main contacts are silver-faced so the switches can remain closed for long periods of time without overheating.

New Fahrenwald Crusher Hailed as an Important Improvement

Important economies in grinding operations may be made possible in the industry by a new type high-speed crusher which has been perfected by A. W. Fahrenwald, metallurgist on the faculty of the University of Idaho school of mines, according to the university's press service.

Predictions have been made that the machine will find general use in the rock-crushing field, turning out tremendous quantities of road material at high speed with little consumption of power.

Its greatest field will be efficient crushing in the range of 3-in. to 1¼-in. and finer, although it can be built to handle sizes up to 8-in. and 10-in. and even larger, it is said. In design the machine is astonishingly small and simple. One moving part, a floating oscillating roll, mounted on a main shaft with anti-friction bearings, bounces along at high speed, crushing the ore against a fixed jaw which can be adjusted to regulate the size of the product.

The high-speed, short-stroke principle is employed giving a finished product unusually uniform in size, making fine crushing possible. Compared to older type crushers, Mr. Fahrenwald's machine is a midget, requiring very little floor space and head room.

The crusher has not yet been commercialized. Several machines have been built in addition to the model which produced such startling results in laboratory tests. Commercial production will put them on the market in a short time, Mr. Fahrenwald declares.

The new crusher is just one more achievement on the part of Mr. Fahrenwald. His flotation machines are used in every part of the world, one large machinery concern producing little else than machines which bear Fahrenwald patents. He also developed a classifier, but is most widely known for his work in flotation.

Mr. Fahrenwald went to the University of Idaho in 1919 and for ten years was stationed at Moscow as ore-dressing engineer for the U. S. Bureau of Mines which has laboratories on the campus. Nearly two years ago he joined the faculty of the school of mines, devoting most of his time to research.

Manufacturers' Publications

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Aerial Tramways

Riblet Aerial Tramways. 48 p., 87 ill. (Riblet Tramway Co., Spokane, Wash.) Describes and illustrates aerial tramways to meet every specific need and includes views of a wide variety of actual installations made by this concern.

Chain

Misco Chain. 4 p., 6 ill. (Bulletin 1-A. The Michigan Steel Casting Co., Detroit, Mich.) Describes and illustrates a special chain for use at a high temperature. Of particular interest to cement-plant engineers as a conveyor of hot clinker.

Drill Steel

Carbon Alloy High Speed and Hollow Drill Steels. 48 p., 12 ill. (Ziv Steel & Wire Co., Chicago, Ill.) Describes and illustrates rock-drill and other drill steels offered by this concern. Contains treatise on heat treating.

Fluid Meters

Mechanically Operated Fluid Meters. 52 p. Illustrated. (Bulletin No. 37. Bailey Meter Co., Cleveland, O.) Describes and illustrates various types of mechanically-operated meters and auxiliary equipment for their installation. Colored meter-chart records showing results obtained by the application of these meters to various processes are included, together with sections on orifice and flow-nozzle location, calibration, pulsating flow, special conditions and special applications. Also includes a long list of users of mechanically-operated fluid meters showing installation data for various services and fluids.

Metal Sheathing

Zilloy—Non-Rusting Metal Roofing and Siding. 8 p., 3 ill. (The New Jersey Zinc Sales Co., New York, N. Y.) Describes and illustrates a corrugated zinc alloy for use as roofing and siding in plant buildings. Includes construction details.

Painting

The Painting of Galvanized Iron. 20 p., 7 ill. (The New Jersey Zinc Co., New York, N. Y.) Describes and illustrates approved methods for painting galvanized iron structures which have been exposed to weathering.

Plant Equipment

General Catalog No. 4,000. 104 p. Illustrated. (Traylor Engineering & Manufacturing Co., Allentown, Pa.) A new edition of this company's catalogue which describes and illustrates its line of cement-making, crushing and mining machinery.

Pumps, Centrifugal

Type SSU Centrifugal Pumping Units. 16 p., 14 ill. (Allis-Chalmers Manufacturing Co., Milwaukee, Wis.) Describes and illustrates a small pumping unit with built-in motor. Valuable pumping charts and head capacity tables are included.

Pyrometers

Hoskins Electric Furnaces and Pyrometers. 40 p., 77 ill. (Hoskins Manufacturing Co., Detroit, Mich.) Describes and illustrates furnaces and pyrometers using nickel - chromium thermo-couple alloys.

Refractories

ADA Products. 12 p., 6 ill. (Botfield Refractories Co., Philadelphia, Pa.) Describes and illustrates a line of fire-brick and other high-temperature cements.

Speed Reducers

IXL Titan Speed Reducers. 48 p., 18 ill. (Catalog No. 102. Foote Bros. Gear & Machine Co., Chicago, Ill.) A new catalogue of helical and herringbone speed reducers using heat-treated and hardened gears, and anti-friction bearings. A new rating method is used for showing horsepowers, inch-pounds torque, slow speeds and high-speed revolutions-per-minute.

Vibrating Screens

The Leahy No-Blind Vibrating Screen. 20 p., 38 ill. (Bulletin 12-E. The Deister Concentrator Co., Fort Wayne, Ind.) Describes and illustrates a vibrating screen in a manner of especial interest to the operating man. Considerable attention is given to the theory and underlying principles of the screening art. In addition to this the pictures throughout the bulletin aptly show methods of installation, some of which are out of the ordinary and, therefore, of unusual interest to the plant engineers and superintendents.

Water Softeners

Boiler Feed Water Purification. 20 p., 14 ill. (The Permutit Co., New York, N. Y.) An outline of the respective merits of various methods used for boiler feed-water treatment with special references to the advantages of the Zeolite water-softening process.

Welding

Pipe Line Welding from the Oxy-Acetylene Viewpoint. 20 p., 18 ill. (Air Reduction Sales Co., New York, N. Y.) A reprint of a valuable and interesting paper presented at a meeting of the American Welding Society.

New Corporations

THOMAS COAL & LIME CO., 9th St. and Badford Ave., Pueblo, Colo. W. N. Thomas, pres. Merger of Pueblo Lime Co., and Thomas & Brown Coal & Brokerage Co. Lime kilns operated north of 8th St. viaduct.

TEXAS PINK GRANITE CO., INC., Granite Mountain, Marble Falls P. O., Tex. Thomas Darragh and George D. Darragh, Marble Falls; Robert D. Clarke, New York. $100,000.

MCCOMB GRAVEL CO., 1319 Crawford St., Houston, Texas. D. A. Gorman. $20,000.

PLAINFIELD SAND & GRAVEL CO., Grand Rapids, Mich. Maurice Sluter, Kirk Sluter, Victor A. Blandford. 35,000 shares n.p.v. To produce sand and gravel.

SOUTH BEND SAND & GRAVEL CO., 3113 Lincolnway W., South Bend, Ind. Merger of George J. Hoffman Sand & Gravel Co., 3113 Lincolnway W., Midget Sand & Gravel Co., Liberty Highway; H. G. Christman & Bros. Sand & Gravel Co., Nancy & Wilson Sts. (all of South Bend); and Beyrer Bros. Sand & Gravel Co., Mishawaka, Ind. Directors are: George J. Hoffman, Herbert A. Hoffman, W. Howard Edwards, Cary R. Moore, J. Lloyd Beyrer, James R. Beyrer, Julius B. Christman, J. Fred Christman and Eugene H. Miller. $500,000.

THUNDER BAY QUARRIES CO., c/o Corp. Trust Co., Wilmington, Del. $500,000.

STRATHMANN SAND & GRAVEL CORP., 328 Market St., Camden, N. J. Henry E. Strathmann, pres.; Arthur D. Smith, vice-pres.-treas.-sec. 2,500 shares n.p.v.

GEZON-BATTJES GRAVEL CO., 1922 Francis Ave., S. E., Grand Rapids, Mich. Benjamin Gezon, pres.; Dean E. Gezon, vice-pres.; Henry E. Battjes, sec.-treas. $50,000. Plant at Wyoming, Grand Rapids P. O., Mich.

AIR CITY GRAVEL CO., Weaver St., Edgemont, Dayton, Ohio. E. W. Campbell, mgr. 200 shares n.p.v.

SOUTHWESTERN GRAVEL CO., J. H. Hurst, gen. mgr., c/o Skirvin Hotel, First and Broadway, Oklahoma City, Okla. $10,000.

STANDARD ROCK ASPHALT CO., Nevada, Mo. B. H. Cubbage, pres., First St., Ft. Scott, Kan. George S. McLaughlin, Deerfield, Mo. To install 3-unit crusher, mixer, engine, etc.

PUEBLO QUARRIES, INC., c/o McCorkle & McCorkle, 714 National Bank Bldg., Pueblo, Colo. J. F. Springfield, Charles E. Sutton, J. R. Greenless. $10,000.

COLUMBIA SAND & GRAVEL CO., 74 Holly St., Columbia, S. C. W. S. Gardner, vice-pres.; Knox Burger, pres.-treas.; D. W. Robinson, Jr., sec. $10,000. To operate sand and gravel pits.

TRANSIT MIX CONCRETE CO., 406 Old Post Bldg., Houston, Texas. L. B. McCaughan, pres.-mgr. $75,000. Will produce own aggregate.

Bulk-Freight Container Facilitates Handling of Rail Shipments

THAT necessity is the mother of invention was never more clearly demonstrated than in the development of the bulk freight container, of which there are several types, accommodating a wide variety of commodities ranging from common brick, crushed stone and gravel to the finer materials such as sand, lime and cement.

These containers are covered by basic patents owned and controlled by the L. C. L. Corp., 230 Park Ave., New York, N. Y. The equipment is leased under license to the railroads for furnishing to shippers in the same manner that any ordinary freight car is furnished.

Although the history of the container has been pretty thoroughly discussed throughout the country in numerous papers written on the subject, it is felt that there may still be fields where this information has not penetrated, and a word here as to the origin of the bulk freight container will not be amiss.

Incident to the suspension of general building construction during the World War, our country found itself, soon after its close, in an active building-material market. One of the commodities in great demand was common brick. Bricks were shipped into New York City, from points along the Hudson River, in barges and unloaded by hand at a cost of from 80c to one dollar per thousand. Water traffic being available only about six months of the year, there were complications when it came to supplying a year-around market. Therefore, there was a need for a more rapid method of unloading bricks from box-cars: one that would reduce to the lowest possible minimum the costly human element. Because of this and of the ever increasing volume of rail traffic, in general, flowing into a limited terminal area and creating endless problems in keeping open the channels of commerce, the stimulus for the birth of the bulk freight container car idea was thus created.

In the fall of 1923, in coöperation with one of the largest Hudson River brick manufacturers, the New York Central Railroad commenced, in an experimental way, the shipment of common bricks, to New York City in brick-container cars from one of its most northern Hudson River brick plants. The middle of January, 1924, saw the beginning of a new epoch, for the brick-container car had proved a success, more cars were built for this traffic, and the bulk freight container came into its own.

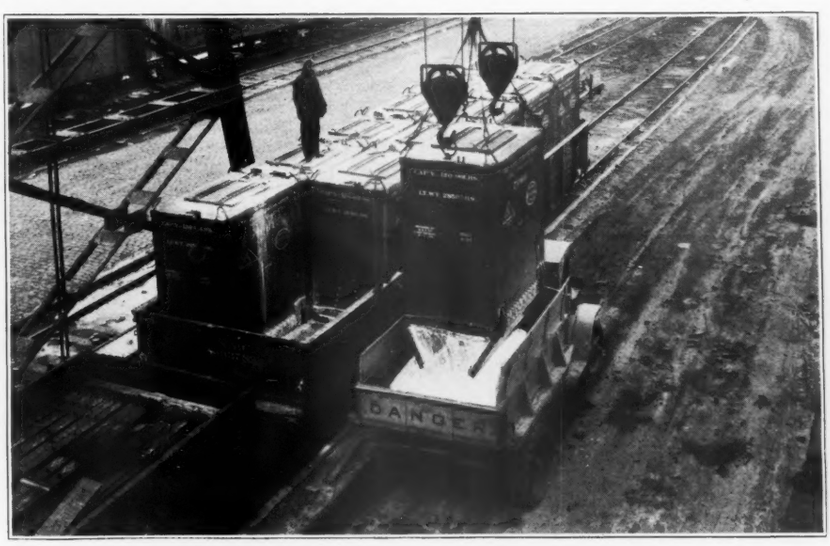
Briefly described, 12 containers, or boxes, are loaded into a low-side gondola (preferably of 70-ton capacity). Two containers are placed crosswise the car and six lengthwise, or two rows of six containers each running lengthwise the car. Each container has a loosely fitting, wooden cover, hinged to the top of two sides, and a semi-tight bottom so constructed that it can be opened or closed by the crane operator, thereby obviating the necessity of additional manpower when unloading the contents. The bricks are loaded at random through the top, 3,000 bricks per container, while the container is either on or off the car, depending upon the facilities of the brick plant. The ordinary brick truck will accommodate 3,000 bricks without taxing its capacity. By increasing the height of the sides of the truck, the contents of two containers, or 6,000 brick can be loaded into one truck, making a load of approximately 10 tons. The operation of transferring the contents of two containers to a truck and replacing the empty containers to the car, requires from 6 to 8 minutes. This means that 12 containers of 36,000 bricks can be unloaded into trucks in not more than one hour and, in the majority of cases, much less time, where trucks are available to take the bricks. Although a boxcar, when loaded with bricks, has only one-half the capacity of a container car, more than twice as much time is required for its unloading.

Twelve bulk containers of lime in a standard railway car.

In the early days of the bulk freight container, a gantry or overhead crane was considered essential in handling containers from car to truck with any amount of speed. However, since the more recent development of the crawler crane, the latter type has become popular where an overhead crane is not available or where the volume of traffic does not warrant the cost of the more expensive type of crane.

Inspired by the success of the brick container and realizing the possibility of utilizing the same method of transportation for other commodities, even though of a different character, there was developed what is known as the lime container. This type differs in construction only in the top and bottom, these two members being watertight. During the latter half of 1927 this type of container was put in service and, by the end of the year, some 34 loaded lime-container cars had been shipped from West Rutland, Vt., originating with the Vermarco Lime Co., and moving over the Clarendon & Pittsford, the Rutland and the New York Central Railroads to New York City. This traffic has since increased in volume and the lime container is a prime factor in the lime market within the Metropolitan District. The rate on lime in container cars is the same as in boxcars, the difference being that the boxcar rate carries with it a minimum of 20 tons, which is seldom exceeded, whereas the container car contains from 50 to 66 tons, thus prac-

Containers of crushed stone being used in building a breakwater.



Container of lime being emptied to truck direct from the car.

tically doubling the side-track capacity of the lime receiver, to say nothing of the saving in labor.

The successful transportation of bulk lime in container cars opened up new possibilities in the building-material field and, soon, the cement manufacturers were looking into the merits of the container car.

In March, 1930, the Alpha Portland Cement Co. of Alsen, N. Y., began experimenting with a container at its plant. Three months later, the Medusa Portland Cement Co. of Bay Bridge, O., made the first shipment of bulk cement in a container car.

At present, the demand for container cars for the shipping of bulk cement is far greater than the available supply. A container holds 27 barrels of cement in bulk, or 325 barrels, running from 60 to 64 tons per car. The unloading of bulk cement differs slightly from that of bulk lime in that the cement is not handled direct to the truck from the car, but to a hopper-bin alongside the track and, from this storage receptacle, the trucks withdraw the cement as required. Thus a car of 12 containers is released in about 30 minutes from the time unloading starts.

The dimensions of a 209-cu. ft. bulk freight container are:

Inside dimensions		Outside dimensions
4 ft. 1 in.	Width	4 ft. 8¾ in. over guides
7 ft. 4¾ in.	Height	8 ft. 4 in. over lifting brackets
6 ft. 11¼ in.	Length	7 ft. 2½ in.

Average light weight 2,300 lb.

Automatic Railway Used at a Texas Cement Plant

Dispatcher at controls in crusher house.

THE Trinity Portland Cement Co. at Eagle Ford, Tex., has an automatic railway at its plant as shown in the accompanying illustrations. The Atlas Car & Mfg. Co. built the cars which operate by means of special electric equipment manufactured by the General Electric Co. This arrangement is known as the "riderless larry car" system, and includes a special method of remote control. Each car is equipped with two 50-hp. squirrel-cage induction motors with electric-solenoid brakes and no other control devices of any kind. Power is collected from the track system. Two operators, located where they can view the loading and unloading of the cars and their movements, govern the principal car movements.

The track on which the cars run is divided into a number of sections insulated from each other, and having transformers and control cabinets. The motor-driven cars collect their energy from an extra-rail system. Switches on control desks in front of the two operators control the delivery of energy to each section of track. By energizing all the sections, a car runs from one end of the track to the other. By energizing one section only, the car runs through that section to the next whereupon, the energy supply being cut off, the brakes automatically set and stop the car. Cars can be "inched" along, a short distance at a time, by applying energy to the section momentarily. Cars will not coast indefinitely on a dead track section because of the automatic action of the brakes. The direction of travel can be changed as simply as the current can be turned on or off—merely by throwing a switch.

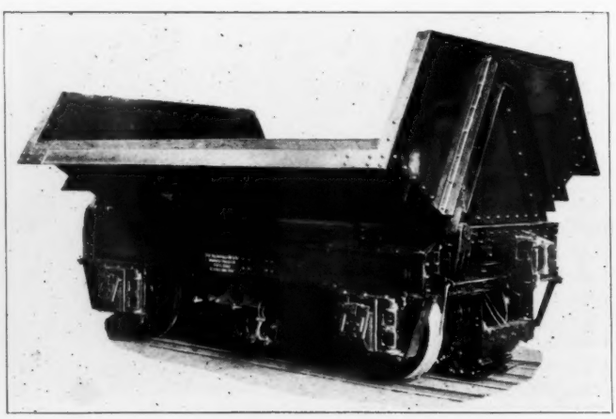
Another interesting feature of the installation is the conservation of power made possible by the use of the squirrel-cage, induction motors. An inherent characteristic of such motors is that they tend to maintain constant speed under all circumstances. On down grades gravity will not materially over-speed the cars but will be automatically converted into electricity, for the motors will then act as generators. The power thus generated will be fed back into the power system, helping to operate other cars on other sections of track.

The use of induction motors is new for such applications, direct-current motors usually being employed. The dump cars to which the electric drive is applied were built, as stated, by The Atlas Car & Mfg. Co. and are of a special side-dumping type especially desirable for severe duty in quarry service. The hopper of the car is a separate unit connected to the frame by heavy steel hinge castings. The cars are dumped at the crusher by a special electric hoist, designed and built by The Atlas Car & Mfg. Co., so that there are no loose parts nor any moving mechanism on the cars to be damaged by steam shovel loading.

Loaded car entering the crusher house.

The April 23, 1930, and July 2, 1930, issues of PIT AND QUARRY described other details of this remarkable haulage system.

Full and empty cars passing quarry face.



Close-up of the riderless, automatic car.

Urges General Superintendent Address Employees at the December Safety Meeting

By W. DEAN KEEFER
Director, Industrial Safety, National Safety Council

IT will be timely for the chairman of your Safety Committee to arrange for an address by the general superintendent of your plant at the December safety meeting.

This meeting will serve as an advance stimulus for your January plant safety meeting, when your annual plant-safety report should be considered in detail.

Your superintendent probably will tell the members of your safety committee and others in attendance that he is especially interested in the safety work of the plant and that he is in agreement with the methods that have been followed toward accident prevention. He probably will outline what are, in his opinion, the specific activities which should be carried on during the coming year by the various groups and individuals of the plant, including the manager, superintendent, foreman, and the workers, to secure the maximum safety.

His talk will be strengthened if he can mention specific safety activities that have been promoted, either by himself or by others, and some of the practical results. These results, stated in detail, should be of unusual interest to all safety committee members and others.

He probably will state that he is anxious to see the annual plant-accident report that will be prepared immediately after January 1, and he may care to make some predictions as to parts of this report which will represent encouraging accomplishments as contrasted with the previous year.

He doubtless will urge every employee to carefully study this report, and will invite suggestions stimulated by this report that may aid in the further improvement of the plant-accident record.

It will be of especial interest if the general superintendent can contrast the past plant safety records with the safety records of other similar organizations. The facts for such a contrast may be easily secured by a study of the 1930 edition of "Industrial Accident Statistics" of the National Safety Council and by getting additional details from other sources. This report, for example, contains the 1929 accident experiences of organizations in the ceramic and non-ferrous metallurgical industries. It also contains a summary of the accident experiences of 138 establishments in the cement industry; and the accident experiences of 125 quarries in the quarry industry. For the detailed accident experiences of these companies in the cement industry special reports may be secured from the Portland Cement Assn. From the U. S. Bureau of Mines may be

secured details of the accident experience of the quarries.

In addition to the address by the general superintendent, your meeting might consider the special topic "Handling Materials."

Many accidents occur to workers when handling materials by hand or by hand trucks. In fact, in the average plant, more workers are injured when handling materials than when working on or with machinery. Thus, anything that is done to eliminate the hazards of handling materials should reduce considerably the accident records of the plant as a whole.

In general, such accidents can be prevented by:

(1) Formulating shop and quarry rules, making these rules known and thoroughly understood by the workers, and then enforcing these rules.

(2) Improving the condition of the shop and quarry equipment, with special attention to good housekeeping.

It should be planned to have a thorough discussion of the subject of handling materials. To accomplish this, it may seem advisable to appoint one or more sub-committees to make a survey either of certain departments or of the entire plant. These committees should be instructed to look for things that may cause material-handling accidents. In making the survey and in preparing their reports, the sub-committee members should be guided by such questions as:

(1) Are bolts and nuts tight on trucks, so the loads will not shift?

(2) Are truck wheels in good condition, so they will not come off?

(3) Are suitable trucks provided for the loads to be carried?

(4) Are trucks equipped with brakes; or is blocking material provided so trucks will not move unexpectedly when being loaded or unloaded?

(5) Are all brakes in good condition?

(6) Is all steering mechanism in good condition?

(7) Are trucks properly loaded, so that the load will not fall and so that men can push them safely?

(8) If trailers are used, are couplers of proper design and in safe condition?

(9) Are floors level and in good repair for safe trucking and carrying materials?

(10) Does poor illumination increase any existing hazards?

(11) Are knuckle guards provided on truck handles where possible?

(12) Are aisles in warehouses and shops of sufficient width to permit safe operation of trucks?

(13) Are piles of materials and warehouses and store rooms so arranged that materials can be handled safely?

(14) Are piled materials cross-tied where necessary to prevent their falling?

(15) Are sacks, barrels, and other containers of suitable size, shape and weight for handling materials safely?

(16) Are gloves or hand leathers used to protect the hands where possible?

(17) Do workers try to lift or carry objects that are too heavy for them to handle safely?

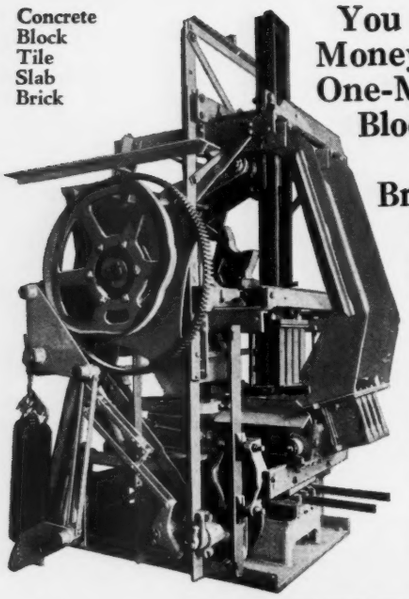
Book Review

DIESEL POWER PLANT HANDBOOK, by *Julius Kuttner*, B.Sc., editor of *Diesel Power*. Published by Diesel Power, 521 Fifth Ave., New York, N. Y.

This is the sixth edition of this excellent reference work which was known formerly as Oil Engine Power Plant Handbook. Its 280 pages comprise two major parts—Engine Room Guide, and Catalog Section. This first part is technical, being divided into chapters on properties of the Diesel engine, airless-injection fuel sprays, fuel-injection pumps, air-injection fuel sprays, air-injection compressors, four-cycle engine valves, two-cycle engine details, major bearings, piston cooling and maintenance, piston-ring action and types, exhaust heat recovery, aid filtration, centrifuging oils, and lubricating oils. These discussions are illustrated with 128 special diagrams and photographs.

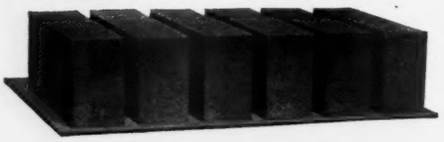
The volume is bound in full flexible leather and sells for $5.

Concrete
Block
Tile
Slab
Brick

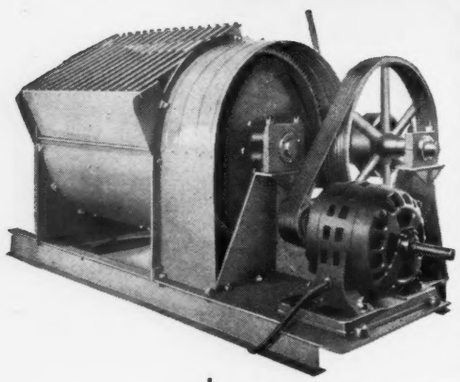


You Can Make Money With This One-Man Concrete Block, Slab, Tile and Brick Machine

The Besser Victory Stripper makes more than 50 sizes and types of concrete building units with only one man to operate and remove blocks from machine. This is the lowest priced entirely automatic concrete block machine. Makes 4 blocks, 8 slabs or tile, or 24 concrete brick per minute. Write for complete details of this big money-earning machine.



The Besser Victory Stripper makes 24 concrete bricks per minute



BESSER
Batch Mixers

Made in 5, 12, 18, 25, 30, 40 and 50 cu. ft. capacities. Besser Mixers are in use in leading plants throughout the country and are preferred because of speed, thorough mixing, long life, easy charging and discharging, low power requirements and low first cost.

The Seven Divisions of BESSER SERVICE to The Concrete Products Industry

1. BESSER SUPER STRIPPER. 8 blocks, 16 slabs or tile or 48 concrete bricks per minute.
   BESSER STANDARD STRIPPER. 6 blocks, 12 slabs or tile or 36 concrete bricks per minute.
   BESSER VICTORY STRIPPER. 4 blocks, 8 slabs or tile or 24 concrete bricks per minute.
   These Stripper Machines make the block on plain pallets and only one set of pallets required for a very large variety of product.
2. BESSER MASTER TAMPER. FACE DOWN MACHINE. 3 to 4 blocks per minute.
3. BESSER BATCH PADDLE MIXERS in Seven Sizes. 5, 12, 18, 25, 30, 40 and 50 cu. ft. capacities.
4. AUTOMATIC CONCRETE BRICK MACHINE. 40 to 50 M per day.
   MASTER CONCRETE BRICK MACHINE. 10 to 20 M per day.
5. BESSER SEWER, CULVERT AND DRAIN TILE MOLD. All sizes up to 5 ft.
6. CARS, PALLETS, ELEVATORS, ETC.
7. BESSER FACILITIES FOR SERVICE AND ENGINEERING ASSISTANCE.

Free Engineering Service

Besser Engineers will design and lay out plants with equipment for any capacity production desired—small or large—and will set up machines and start them in successful operation. Estimates on plant equipment gladly furnished. Write or wire.

BESSER MANUFACTURING CO.
Main Office and Factory
512 30th STREET, ALPENA, MICHIGAN

District Sales Offices at
Philadelphia — Newark — Dayton — Chicago — Milwaukee
Omaha — Detroit — Pittsburgh — Indianapolis

CORDEAU-BICKFORD
DETONATING SAFETY FUSE

does a thorough job!

You can count on Cordeau-Bickford to do the job of detonation thoroughly and instantaneously. It is especially recommended for large charges. It is indorsed by thousands of satisfied operators everywhere.

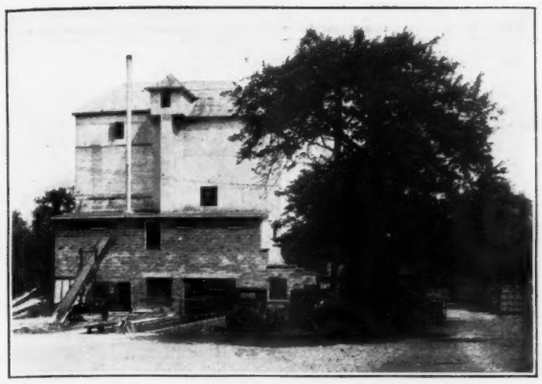
With a speed of 17,500 feet per second, Cordeau-Bickford will set off the largest blast throughout its entire length—instantaneously. Cordeau-Bickford gets maximum results at low cost. Insensitive to shock or friction, it can be used, stored and handled with perfect safety at all times.

Illustrated booklet tells how to get better blasting results with Cordeau-Bickford. Write for your copy.

NEW
STEEL SPOOL

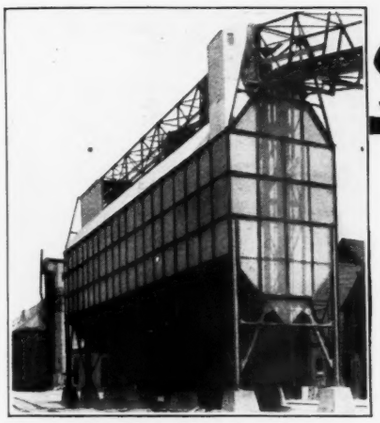
This steel spool has been developed and adopted for use as being a stronger spool than our present wooden-headed ones.

ENSIGN-BICKFORD CO.
SIMSBURY, CONN.



Cement Block Plant, completely equipped with Butler Bins and Proportioning Equipment.

Butler Bin with automatic feeder for Asphalt plant.



Butler Unit Bin of 5 sections for storage and proportioning of aggregates.

STANDARDIZED!

WHITMORE-RAUBER & VICINUS

OF ROCHESTER, NEW YORK

IS COMPLETELY BUTLER EQUIPPED

Ready-Mixed Concrete Plant with bin equipment for aggregates and cement.

IN replacing old equipment and erecting new plants, this progressive organization has standardized on Butler Bins a means of further improving and perfecting its already efficient service.

For Commercial Concrete, Asphalt Preparation, Yard Storage and Proportioning, Cement Blocks and Road Contracting, Whitmore-Rauber & Vicinus has Butler Plants.

Each plant was engineered for the particular job it had to do, but each is basically standard Butler equipment adapted to local conditions.

Butler equipment has demonstrated its economy and dependability in thousands of installations. Let us suggest the proper Butler equipment for your job.

Type "V" Contractors Bin with All-steel, 2 beam scale and 2 compartment Weighing Hopper.

BUTLER
Steel **BINS**

BUTLER BIN COMPANY

WAUKESHA *Representatives in Fifty Cities* **WISCONSIN**